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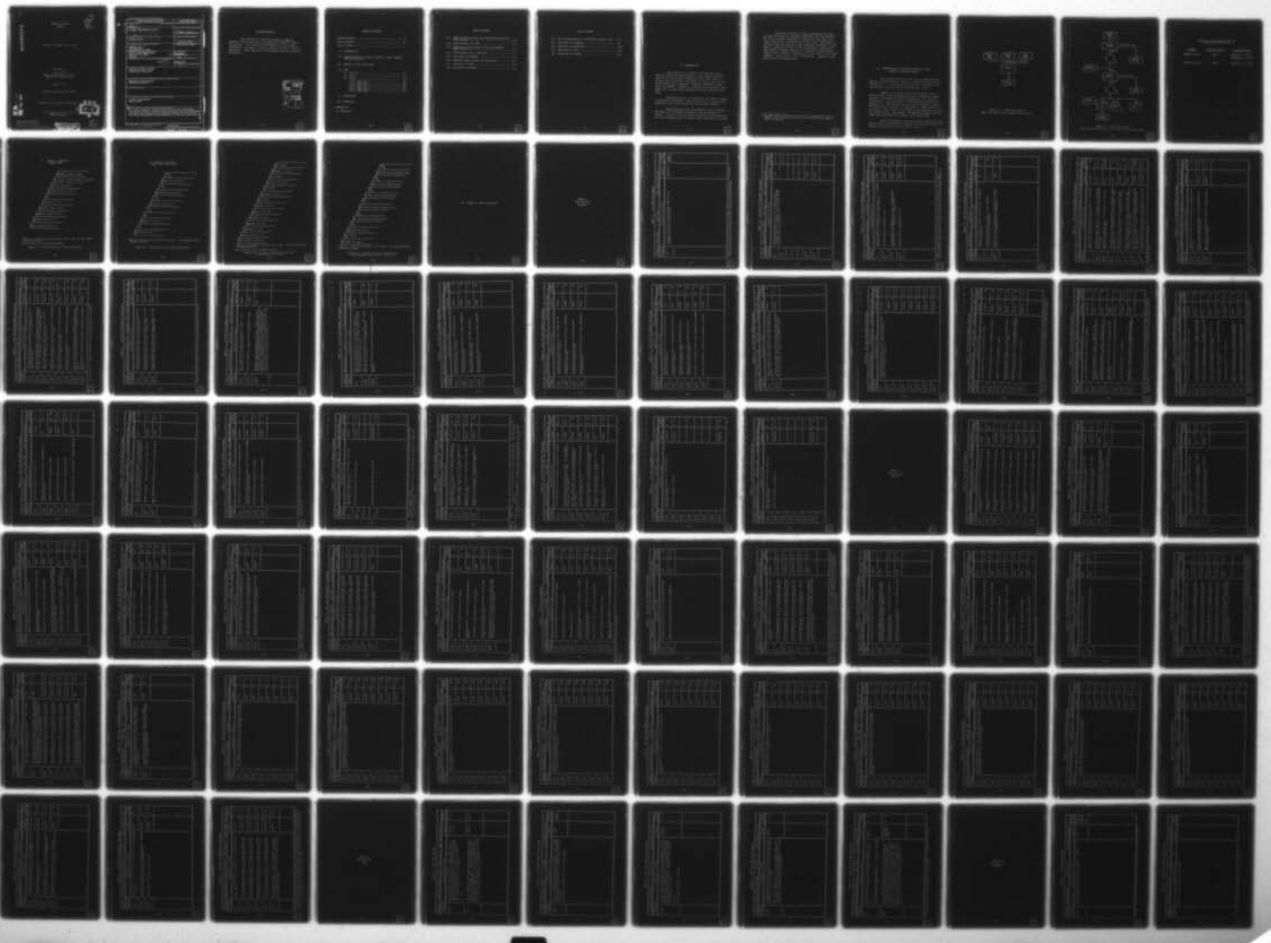

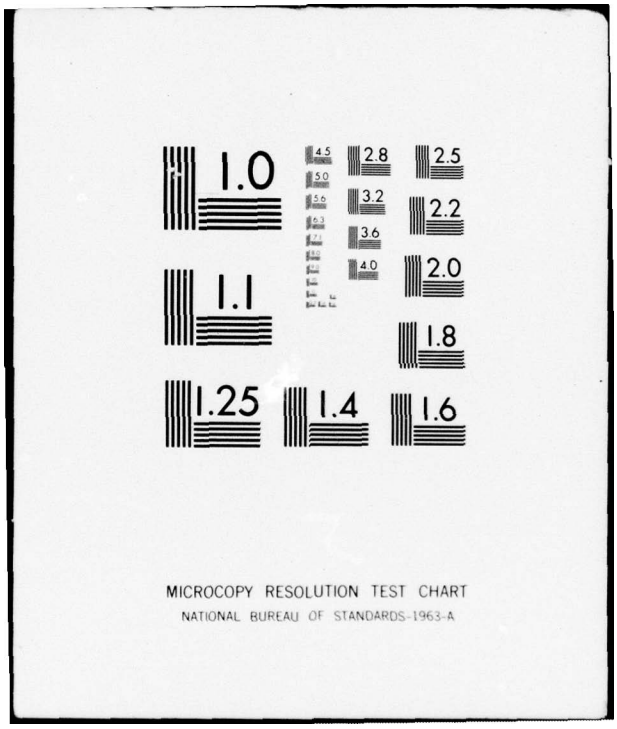
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NATIONAL BUREAU OF STANDARDS-1963-A

TECHNICAL REPORT
1120-A

THE AIRS CDC-6600 USER'S GUIDE

submitted to

J.A. diToro
Naval Air Development Center
Warminster, Pennsylvania

30 May 1974

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Tactical Reconnaissance
Computer Model

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report presents the instructions for the use of the AIRS(Airborne Reconnaissance System) Performance Simulation Model on the CDC 6600 Computer. This model uses an expected value approved to determine the performance of a multisensor reconnaissance aircraft operating in a specified target scenario.

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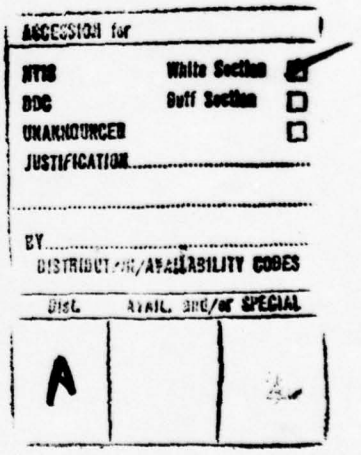

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I. INTRODUCTION

This document is intended to aid the user of the Airborne Integrated Reconnaissance System (AIRS) Performance Model on the Control Data Corporation (CDC) 6600 computer. In particular, sufficient information is given to run the following AIRS computer programs: SCENARIO, EXECUTIVE, INTER, EVAL, and PREPROC. PREPROC is a new AIRS program module whose purpose is to ensure that input data has been defined reasonably.

Additional sources of information for AIRS are listed in Section VI, REFERENCES. Superscripts refer to this section. Reference 3 was a user's guide for the CDC-3300 computer.

Some programs may be run separately, but in general the input of one program is dependent upon the output of another. Section II of this report discusses the interrelation of the six programs and the control cards necessary to run them.

Section III consists of tables specifying the format of input data decks for SCENARIO, EXECUTIVE, EVAL, AND PREPROC. The range of values acceptable to PREPROC for each input variable is indicated.* INTER requires no data deck. The format of printed output has previously been documented (reference 2) and, with the exception of EVAL, is not treated here. Because the EVAL output is complex, Section IV is devoted to EVAL printed output format. Section V contains macro flow charts of the AIRS programs. Section VI is a list of references. Appendix A documents conversion changes made.

* If input values exceed the range listed a diagnostic results. However, the simulation itself is not limited to the range of values indicated.

II. INTERRELATION OF SCENARIO, EXECUTIVE, EVAL, COMPLEX, INTER AND PREPROC

This section will enable the user to understand the physical interrelationships among six component programs of the AIRS model [1], [2]. It is assumed that the user is familiar with the CDC 6600 system for which this guide was written.

Figure 2-1 is a flow diagram of the overall model. The rectangular boxes represent physically independent computer programs. Card and file input as appropriate, are shown for each program. Input data decks are specified in the tables of Section III. (No data deck is associated with INTER.) Arrows show flow both into and out of each program. TAPEn, where n is an integer, names a logical file which is not necessarily stored on a physical tape. For example, the EXECUTIVE program reads an input file named TAPE1 and outputs a file named TAPE2.

Table 2-1 contains a list of references that can be used by the reader to find detailed information concerning format and content for each of the files named in Figure 2-1.

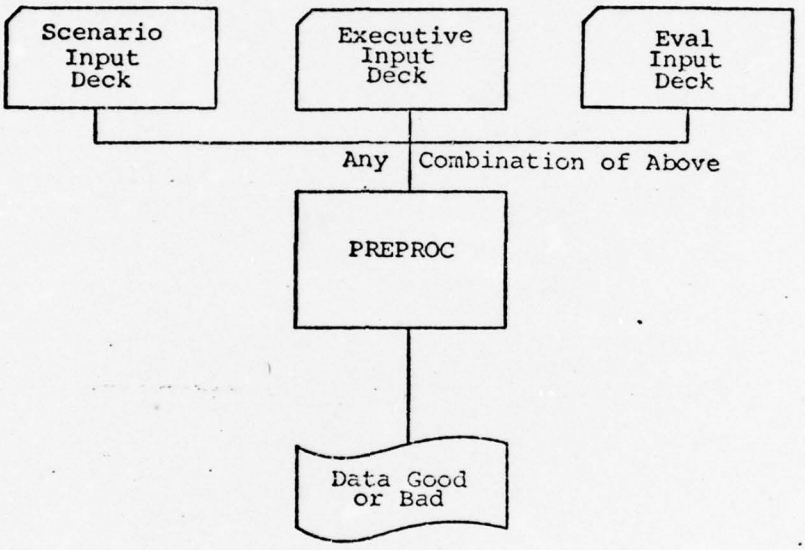


Figure 2-1. AIRS Interprogram
Data Flow Relationship Between AIRS Programs

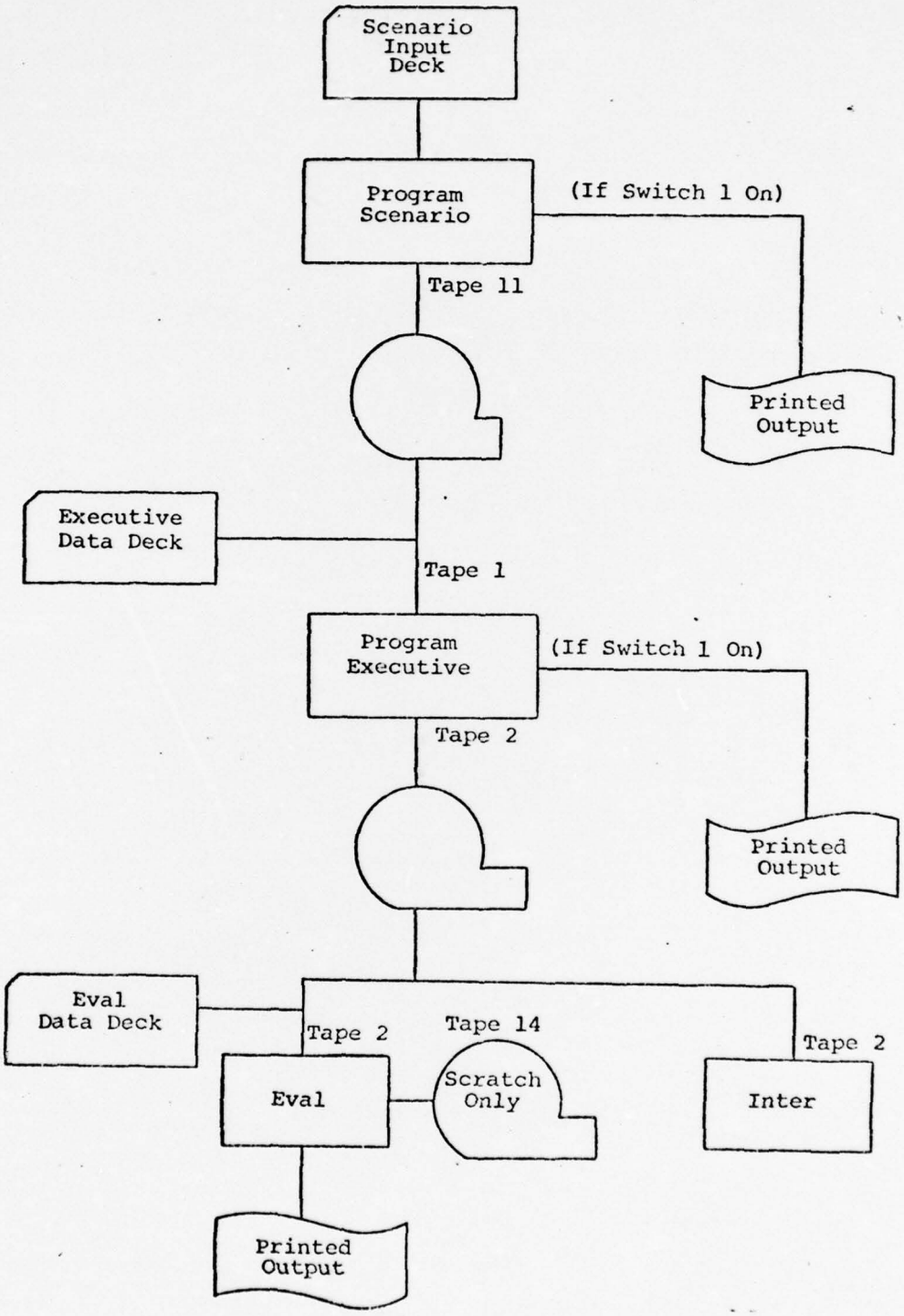


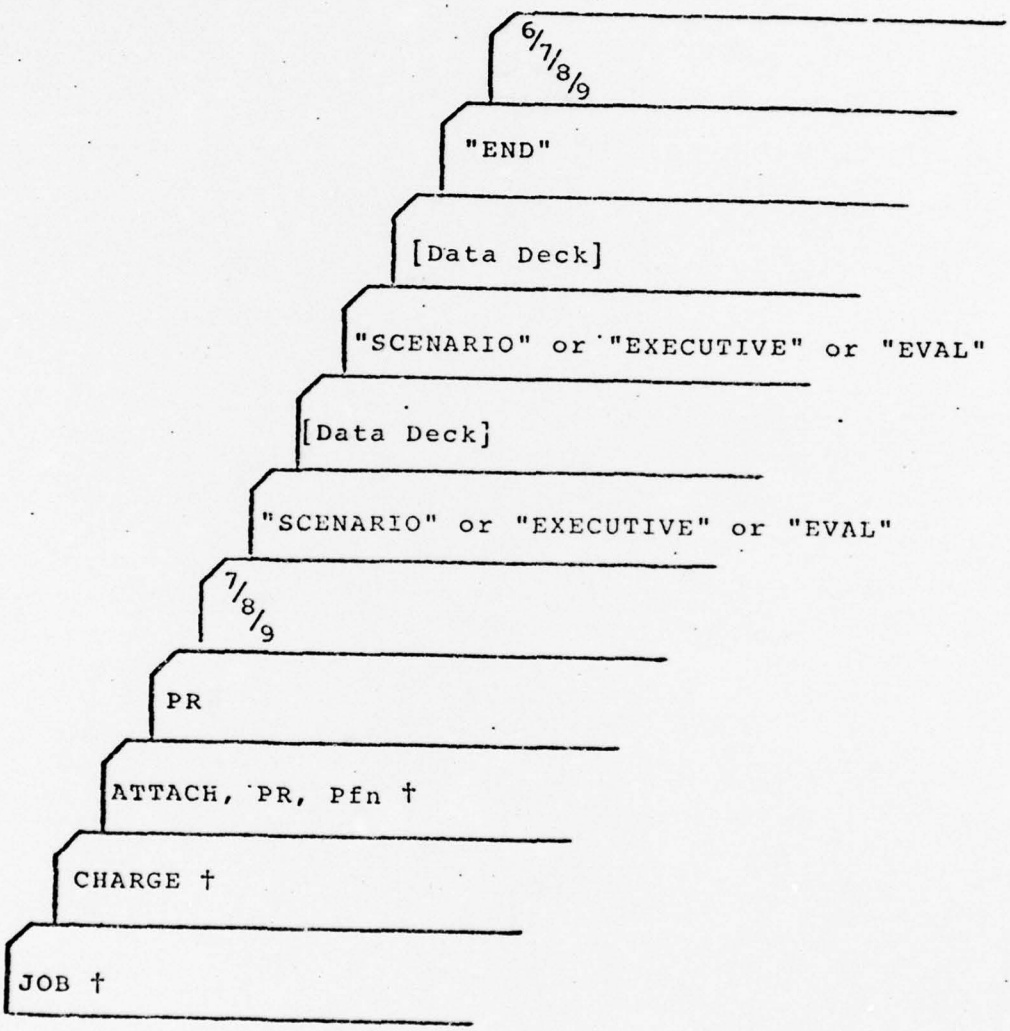
Figure 2-1. AIRS Interprogram
Data Flow Relationship Between AIRS Programs (Continued)

TABLE 2-1. KEY TO DESCRIPTIONS OF INTERMEDIATE OUTPUT FILES

PROGRAM	TAPE DESIGNATION	REFERENCE SOURCE
SCENARIO Output	Tape 1	Paragraph 2.7.2[1] Paragraph 7.2.2.1[2]
EXECUTIVE Output	Tape 2	Paragraph 7.3.2.1[2]

Figure 2-2 shows the job deck structure for running the AIRS computer model. It is assumed that permanent binary files of each program have previously been created. Figure 2-3 shows how to create such permanent files from the source FORTRAN card decks.

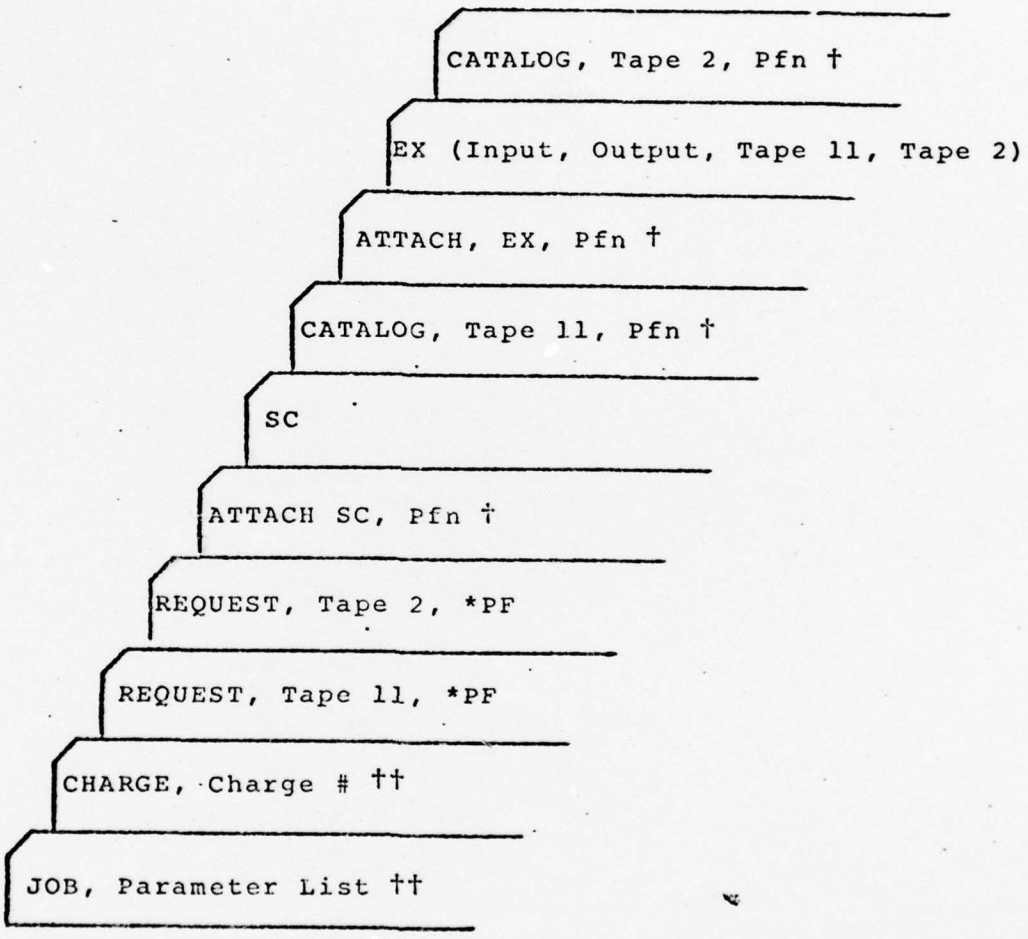
A. PREPROC



†Pfn is a user-chosen permanent file name. See CDC-6600 SCOPE REFERENCE MANUAL.

Figure 2-2. Deck Structure for AIRS

B. SCENARIO, EXECUTIVE,
INTER, EVAL

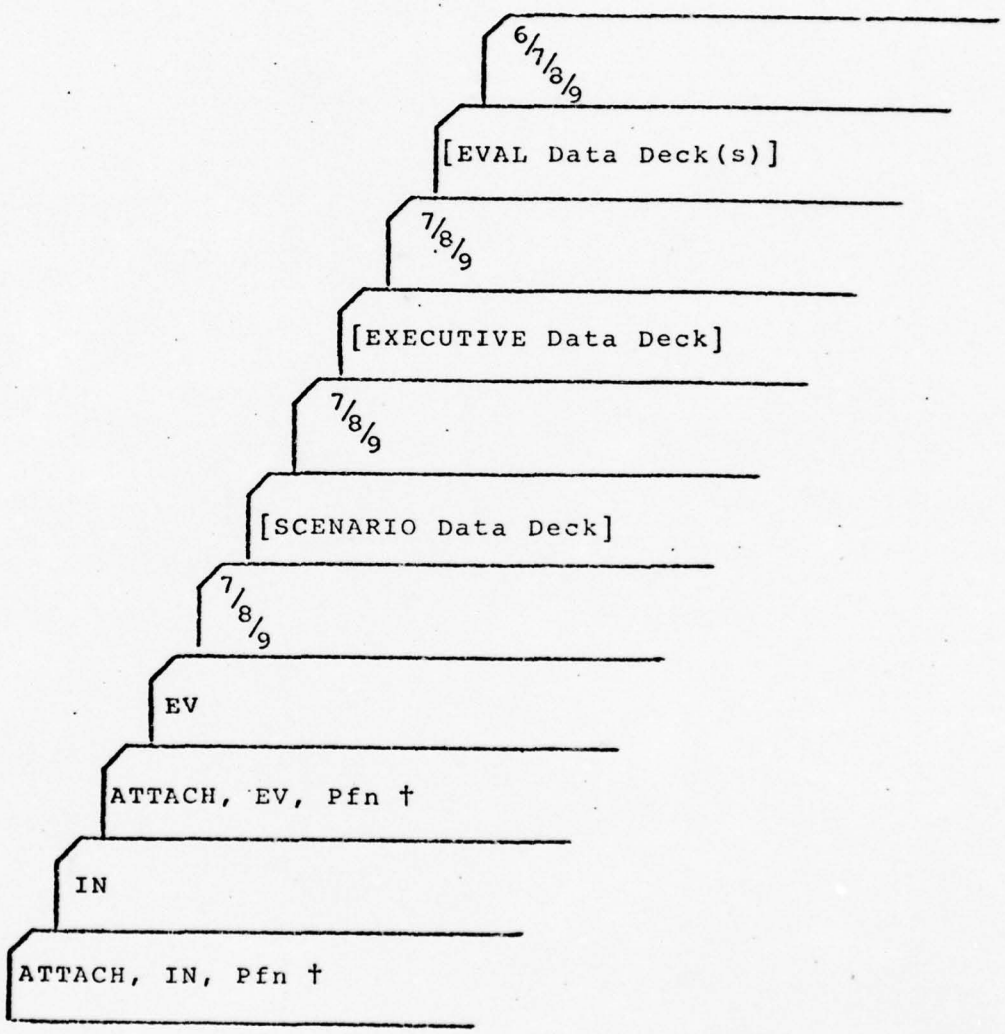


†Pfn is a user-chosen permanent file name. See CDC-6600 SCOPE REFERENCE MANUAL.

††See CDC-6600 SCOPE REFERENCE MANUAL.

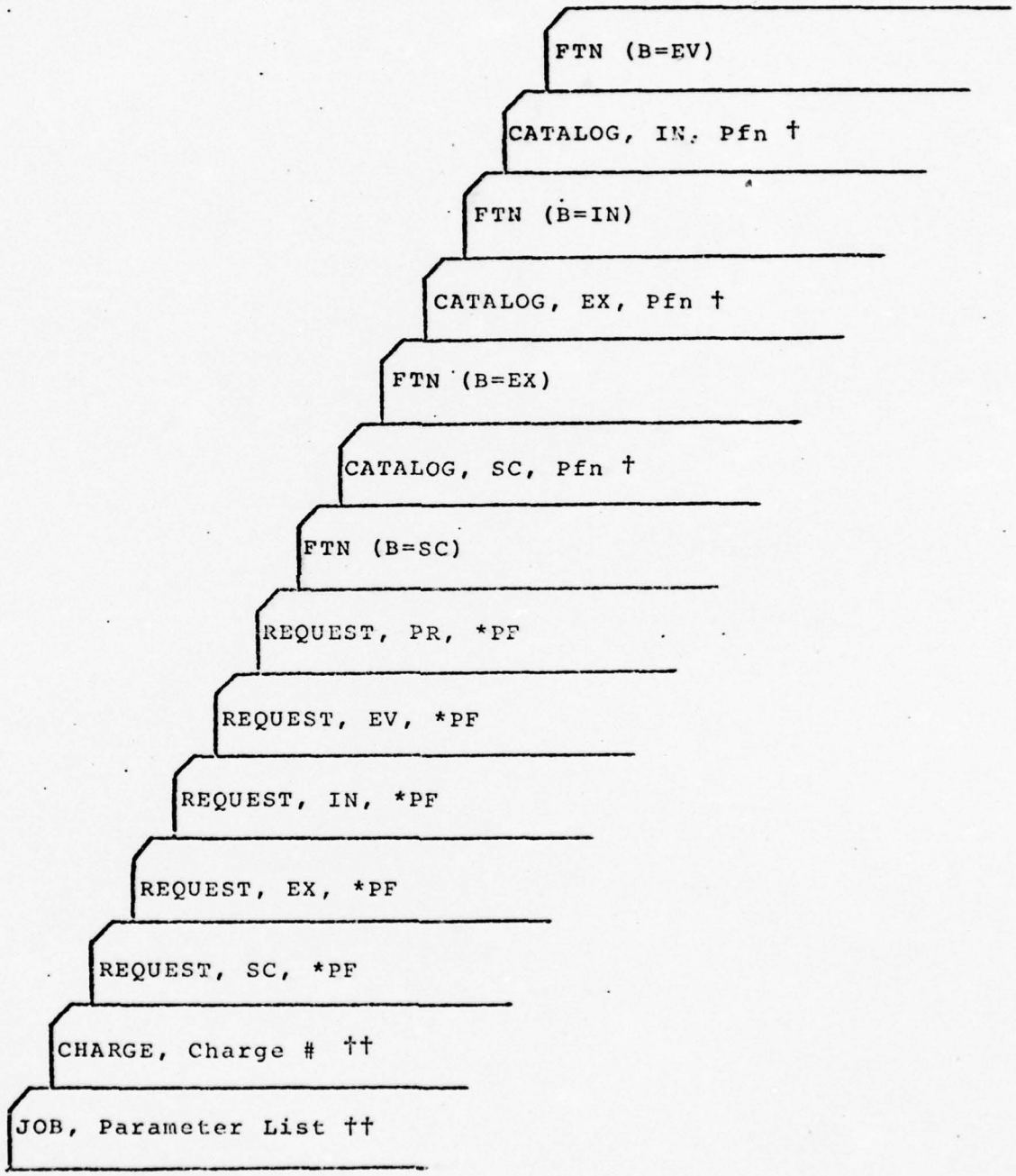
Figure 2-2. Deck Structure for AIRS (Continued)

B. SCENARIO, EXECUTIVE,
INTER, EVAL (Continued)



†Pfn is a user-chosen permanent file name. See CDC-6600 SCOPE REFERENCE MANUAL.

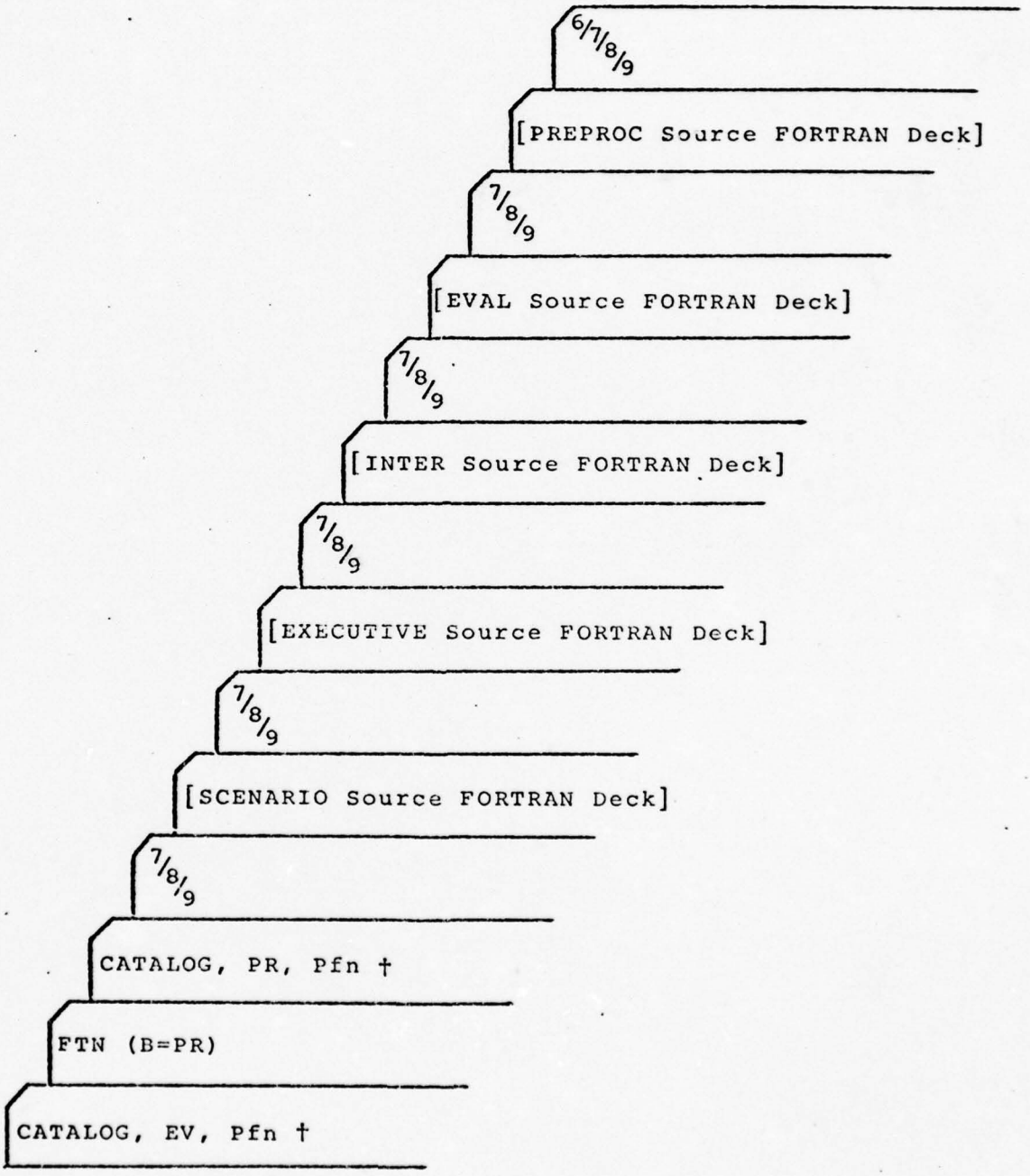
Figure 2-2. Deck Structure for AIRS (Continued)



†Pfn is a user-chosen permanent file name. See CDC-6600 SCOPE REFERENCE MANUAL.

††See CDC-6600 SCOPE REFERENCE MANUAL.

Figure 2-3. Creating Permanent Binary Files from FORTRAN Source Decks



†Pfn is a user-chosen permanent file name. See CDC-6600 SCOPE REFERENCE MANUAL.

Figure 2-3. Creating Permanent Binary Files from FORTRAN Source Decks (Continued)

III. FORMAT OF INPUT DATA DECKS

TABLE 3-1
DATA DECK FOR
SCENARIO

TABLE 3-1. DATA DECK FOR SCENARIO

Subject: Title Card	Card Type: 1	Total Number This Type: 1	
Columns & Format	Description of Field	Mnemonic	Range* Low High
1-80 20 (A4)	Descriptive title for the current computer run. Content of title is unrestricted.	IALPHA(I)	ALPHA/ NUMERIC

* These limits are used only in the PREPROC module of the simulation. If exceeded, a diagnostic printout is provided; however, the program does not abort.

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Sensor On/Off Control Card Type: 2 Total Number This Type: 1

Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-5 I5	On/off control for each of the fifteen sensors -- "1" indicates that a sensor is on for the current computer run. "0" indicates that a sensor is off. A blank field is read as "0".	II(1)	0	1
6-10 I5		II(2)	0	1
.		.	.	
.		.	.	
.		.	.	
66-70 I5		II(14)	0	1
71-75 I5		II(15)	0	1

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Geographical Boundaries* Card Type: 3 Total Number This Type: 1

Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-5 I5	Minimum degrees latitude for current run. "+" designates degrees North. "-" designates degrees South.	LATMIN	-90	90
6-10 I5	Maximum degrees latitude for run.	LATMAX	-90	90
11-15	Minimum degrees longitude for run. "+" designates degrees East. "-" designates degrees West.	LONMIN	-180	180
16-20 I5	Maximum degrees longitude for run.	LONMAX	-180	180

*These boundaries should closely define the area of interest in the scenario. The location of each target (see card type #5) must fall within these boundaries.

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Index Limits	Card Type: 4	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-5 I5	Number of types of targets for this run. A maximum of 30 is permitted.	NT	1	30
6-10 I5	Number of individual targets in this scenario. A maximum of 200 is permitted.	N	1	200
11-15 I5	Number of types of backgrounds against which targets may be set. A maximum of 15 is permitted.	NBKG	1	15

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Individual Target Specifications Card Type: 5* Total Number This Type: N**			
Columns & Format	Description of Field	Mnemonic	Range Low High
1-5 I5	Code number indicating type of this target: an integer between one and NT (see card type 4).	ITYP(I)	1 NT**
6-15 F10.0	Latitude of this target: "+" for North, "-" for South. Punch as AAA.BBCC where AAA is degrees, BB minutes, and CC seconds.	X(I)	-90 90
16-25 F10.0	Longitude of this target: "+" for East, "-" for West. Punch as AAA.BBCC as above.	Y(I)	-180 180
26-35 F10.0	Altitude of this target expressed as a multiple (between -3 and +3) of the rms elevation of the terrain. (See card type 9).	Z(I)	-3 +3
36-40 I5	Code designating if this target is a preplanned point of interest for this flight: "0" for yes, "1" for no.	IPRE(I)	0 or 1
41-45 I5	Code designating air-to-air keying of data from this target: "0" for yes, "1" for no. Used in PI-Q program to determine size of data package.	IIK(I)	0 or 1
46-50 I5	Code number indicating type of background against which this target is set: an integer between one and NBKG (see card type 4).	IBKG(I)	1 NBKG**
51-55 I5	Code designating that precipitation is falling directly on this target: "1" for yes; "2" for no.	IWEATH(I)	1 or 2

*Card 5 is continued on next page.
**See card type 4.

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Individual Target Specifications Card Type: 5 Total Number This Type: N*

Columns & Format	Description of Field	Mnemonic	Range Low	Range High
56-65 F10.0	Ground speed of this target expressed in nautical miles per hour.	V(I)	0	5K
66-75 F10.0	Direction in which this target is moving expressed in degrees clockwise from North.	THT(I)	0	360
76-80 F5.0	The fraction of time during which this target radiates ECM detectable signals.	PRAD(I)	0	1

*See card type 4.

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: ECM Characteristics of Target Types Card Type: 6 Total Number This Type: NT*				
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
6-15 F10.0	Peak transmitter power expressed in decibels above 1 watt for this type of radar.**	PT(I)	0	100
16-25 F10.0	Transmitter antenna gain expressed in dB.	GT(I)	0	50
26-35 F10.0	Frequency expressed in MHz.	FREQ(I)	0	30K
36-45 F10.0	Transmitter antenna front-to-back ratio expressed in dB.	CKA(I)	0	50
46-55 F10.0	Pulse repetition rate expressed in pulses per second.	PRF(I)	0	3K
56-65 F10.0	Pulse duration expressed in microseconds.	THETA1(I)	0	100
66-75 F10.0	Antenna scan period expressed in seconds.	TSCPS(I)	0	100

*See card type 4.
**Members of this set (card type 6) corresponding to non-radar target types may be left blank but there must be exactly NT cards in this set.

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Characteristics of Background Types Card Type: 7 Total Number This Type: NBKG*

Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Optical reflectivity or average reflectivity at optical frequencies of this type of background, expressed as a decimal fraction.	BKG(K,1)	0	1
11-20 F10.0	Backscatter coefficient of this type of background at the frequency of the MTISLR, expressed as a decimal fraction.	BKG(K,2)	0	1
21-30 F10.0	Backscatter coefficient of this type of background at the frequency of the SLR, expressed as a decimal fraction.	BKG(K,3)	0	1
31-40 F10.0	Backscatter coefficient of this type of background at the frequency of the MTIFLR, expressed as a decimal fraction.	BKG(K,4)	0	1
41-50 F10.0	Average thermal emissivity of this type of background in band 1 of the IR and FLIR sensors, expressed as a decimal fraction.	BKG(K,5)	0	1
51-60 F10.0	Average thermal emissivity of this type of background in band 2 of the IR and FLIR sensors, expressed as a decimal fraction.	BKG(K,6)	0	1
61-70 F10.0	Temperature of this type of background expressed in degrees Kelvin.	BKG(K,7)	0	400

*See card type 4.

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Characteristics of Target Types	Card Type: 8a	Total Number This Type: NT*		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Optical reflectivity or average reflectivity at optical frequencies of this type of target, expressed as a decimal fraction.	TS(K,1)	0	1
11-20 F10.0	Resolution required for 0.9 probability of detection by an ideal observer with a photographic sensor expressed in feet. See paragraph 3.2.7.1.4 of AIRS, Volume 1.	TS(K,2)	.5	100
21-30 F10.0	Radar cross section of this type of target at MTIFLR frequency, expressed in square meters.	TS(K,3)	.5	900K
31-40 F10.0	Radar cross section of this type of target at SLR/MTISLR frequency, expressed in square meters.	TS(K,4)	.5	900K
41-50 F10.0	Radar reflectivity of this target type at SLR frequency, expressed as a decimal fraction.	TS(K,5)	0	1
51-60 F10.0	SLR resolution required for 0.5 probability of detection, expressed in meters.	TS(K,6)	.5	100
61-70 F10.0	Area of cross section from which infrared radiation is emitted assuming a spherical target, expressed in square meters.	TS(K,7)	.1	10K
71-80 F10.0	Temperature of this type of target, expressed in degrees Kelvin.	TS(K,8)	0	400

*See card type 4; cards 8a and 8b are stacked alternately in the deck.

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Characteristics of Target Types Card Type: 8b Total Number This Type: NT*				
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Infrared sensor resolution required for 0.9 probability of detection for this type of target (meters).	TS(K,9)	.5	100
11-20 F10.0	Thermal emissivity of this target type in band 1 of the infrared sensor (see card type 1 of Table 3-2).	TS(K,10)	0	1
21-30 F10.0	Thermal emissivity of this target type in band 2 of the infrared sensor (see card type 1 of Table 3-2).	TS(K,11)	0	1

*See card type 4; cards 8a and 8b are stacked alternately in the deck.

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Terrain Descriptors Card Type: 9 Total Number This Type: 1

Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Wave length of the terrain expressed in feet. See paragraph 2.4.3 of AIRS, Volume 1.	OMEGAL	0	50K
11-20 F10.0	Root mean square of terrain height expressed in feet.	SIGMER	.1	5K
21-30 F10.0	Coherence angle expressed in radians. This is a user estimate of the minimum distance between two looks which are statistically independent with respect to terrain shadowing. A triangle is described wherein the base is drawn between the positions of the aircraft at looks n and n+1 and the apex is the position of the target. The coherence angle is opposite to the base.	PHI	0	3

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: ECM Descriptors Card Type: 10 Total Number This Type: 1

Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-5 I5	Number of beams (roughly corresponds to number of receiving antennas), i.e., the number of statistically independent observations of the target within a circle with the aircraft at the center.	NBEAM	1	25
6-15 F10.0	Maximum range expressed in nautical miles. This limits ECM records per target to a manageable number.	RMAX	1	200
16-25 F10.0	Localization blind angle beneath aircraft expressed in degrees.	THETA2	0	120

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Side-Looking Radar Descriptions Card Type: 11 Total Number This Type: 1

Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Minimum angle from A/C nadir at which target can be detected, expressed in degrees.	THET12	1	30
11-20 F10.0	Maximum angle at which detection can occur, expressed in degrees from nadir.	THET13	1	89
21-30 F10.0	Minimum slant range at which detection can occur, expressed in nautical miles.	RMIN1	.5	20
31-40 F10.0	Maximum range at which detection can occur, expressed in nautical miles.	RMAX1	1	200

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: MTISLR Descriptors	Card Type: 12	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Minimum angle from A/C nadir at which target can be detected, expressed in degrees.	THET22	1	30
11-20 F10.0	Maximum angle at which detection can occur, expressed in degrees from nadir.	THET23	1	89
21-30 F10.0	Minimum slant range at which detection can occur, expressed in nautical miles.	RMIN2	.5	20
31-40 F10.0	Maximum range at which detection can occur, expressed in nautical miles.	RMAX2	1	200

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: MTIFLR Descriptors	Card Type: 13	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Maximum depression angle at which detection can occur, expressed in degrees.	PHIA	1	90
11-20 F10.0	Minimum depression angle at which detection can occur, expressed in degrees.	PHIB	1	90
21-30 F10.0	Minimum slant range at which detection can occur, expressed in nautical miles.	RMINF	.5	20
31-40 F10.0	Maximum slant range at which detection can occur, expressed in nautical miles.	RMAXF	1	200
41-50 F10.0	Half-angle of antenna azimuth sweep, expressed in degrees.	OMEGF	0	45
51-60 F10.0	Antenna scan interval, expressed in tenths of a second.	FLRFRQ	1	100

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Infrared Geometric Limits Card Type: 14 Total Number This Type: 1

Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Maximum angle at which detection can occur expressed in degrees from A/C nadir; should be one-half of the scanned angle.	THET32	1	89
11-20 F10.0	Maximum slant range at which detection can occur expressed in nautical miles. This is an artificial limit to restrict the records per target to a manageable number.	RMAXIR	0	50

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Camera Type Designation	Card Type: 15	Total Number This Type: 1		
Columns & Format	Description of Field		Mnemonic	Range Low High
1-5 I5	Code designating camera 1 to be: pan "0"; side oblique frame or vertical frame "1"; or forward oblique "2". Repeat for cameras 2 through 8.		IKIND(1)	0, 1 or 2
6-10 I5			IKIND(2)	0, 1 or 2
11-15 I5			IKIND(3)	0, 1 or 2
16-20 I5			IKIND(4)	0, 1 or 2
21-25 I5			IKIND(5)	0, 1 or 2
26-30 I5			IKIND(6)	0, 1 or 2
31-35 I5			IKIND (7)	0, 1 or 2
36-40 I5			IKIND (8)	0, 1 or 2

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Camera Descriptors (Pan) Card Type: 16a Total Number This Type: 8*

Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Focal length of this camera expressed in inches.	FLENG(I)	.1	100
11-20 F10.0	Half-angle subtended by the film expressed in degrees.	ANGS(I)	1	90
21-30 F10.0	Height of the film expressed in inches.	HFLM(I)	1	50
31-40 F10.0	Percent (a number between 0 and 100) of overlap on the longitudinal axis, measured at A/C nadir.	OPR(I)	0	100
41-50 F10.0	Angle between nadir and focal axis expressed in degrees, "+" for forward oblique, "-" for aft oblique pan camera.	THTC(I)	-89	89
51-60 F10.0	Code designating day "1" or night "2".	PREVR(I)	1 or 2	

*There are three variants of card type 16 corresponding to the three types of cameras. Prepare only one variant for each camera that is turned on (see card type 2) up to a maximum of 8.

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Camera Descriptors (Forward Frame) Card Type: 16b Total Number This Type: 8*

Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Focal length of this camera expressed in inches.	FLENG(I)	1	100
11-20 F10.0	Frame width expressed in inches. ("Width" is the dimension most nearly in the direction of the aircraft axis.)	SW(I)	1	50
21-30 F10.0	Frame length expressed in inches. ("Length is the dimension most nearly in the direction of the wing axis.)	SL(I)	1	50
31-40	Leave blank. This field not used for forward oblique frame cameras.	OPR(I)		
41-50 F10.0	Angle between nadir and focal axis expressed in degrees.	THTC(I)	1	89
51-60 F10.0	Code designating day "1" or night "2".	PREVR(I)	1 or 2	
61-70 F10.0	Half-angle of slewing capability expressed in degrees. Leave blank or set to zero if this camera is not movable.	ELG(I)	0	45

*There are three variants of card type 16 corresponding to the three types of cameras. Prepare only one variant for each camera that is turned on (see card type 2) up to a maximum of 8.

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Camera Descriptors (Side Oblique or Vertical Frame)	Card Type: 16 c	Total Number This Type: 8*		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Focal length of this camera expressed in inches.	FLENG(I)	.1	100
11-20 F10.0	Frame width expressed in inches. ("Width" is the dimension most nearly in the direction of the aircraft axis.)	SW(I)	1	50
21-30 F10.0	Frame length expressed in inches. ("Length" is the dimension most nearly in the direction of the wing axis.)	SL(I)	1	50
31-40 F10.0	Percent (a number between 0 and 100) of overlap on the longitudinal axis, measured at A/C nadir.	OPR(I)	0	100
41-50 F10.0	Angle between nadir and focal axis expressed in degrees, "+" to right, "-" to left.	THTC(I)	-89	89
51-60 F10.0	Code designating day "1" or night "2".	PREVR(I)	1 or	2
61-70 F10.0	Minimum depression angle of the focal axis expressed in degrees. Set to zero if this camera is not movable.	ELG(I)	0	90
71-80 F10.0	Maximum depression angle of the focal axis expressed in degrees. Set to zero if this camera is not movable.	ELG1(I)	0	90

*There are three variants of card type 16 corresponding to the three types of cameras. Prepare only one variant for each camera that is turned on (see card type 2) up to a maximum of 8.

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: FLIR Descriptors	Card Type: 17	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	High
1-10 F10.0	The maximum depression angle of the field-of-view when slewed to limits, expressed in degrees.	THEMA	1	89
11-20 F10.0	The minimum depression angle of the field-of-view when slewed to limits, expressed in degrees.	THEMI	1	89
21-30 F10.0	Half-angle of azimuth sweep when slewed to limits, expressed in degrees.	BETA15	1	45
31-40 F10.0	Half-angle of horizontal beam spread, when the FLIR is not slewed, expressed in degrees.	RH015	1	45
41-50 F10.0	Half-angle of vertical beam spread, when the FLIR is not slewed, expressed in degrees.	PMI15	1	45
51-60 F10.0	Depression-angle to the central beam when the sensor is in the rest position. See figure 2-5, AIRS, Volume I.	THA15	1	89
61-70 F10.0	Optimal display time for a single image expressed in seconds. See page 2-44 of AIRS, Volume 1.	DTO	.5	10

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Weather Descriptors	Card Type: 18a	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Direction from which wind comes, expressed as degrees clockwise from North.	WINDTH	0	360
11-20 F10.0	Wind speed, expressed in nautical miles per hour.	WINDSP	0	100
21-30 I 10	Code designating the type of precipitation: rain "1", snow "2", or no precipitation "0".	IRAIN	0, 1 or 2	
31-40 F10.0	Precipitation rate, expressed as inches per hour of water.	TRAIN	0	5
41-50	Leave blank.			
51-60 F10.0	Visibility in clouds, expressed in statute miles.	XOC	.01	1
61-70 F10.0	Visibility in rain, expressed in statute miles.	XOP	.5	5
71-80 F10.0	Visibility in haze, expressed in statute miles.	XOH	2	20

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Weather Descriptors Card Type: 18b Total Number This Type: 1

Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 I10	Code indicating day "1" or night "2".	PREVERE	1 or 2	
11-20 F10.0	Probability of no undercast clouds, expressed as a decimal fraction.	P3	0	1
21-30 F10.0	Height of cloud base, expressed in feet.	CLOUDB	500	5000
31-40 F10.0	Height of cloud top, expressed in feet..	CLOUDT	1K	10K
41-50 F10.0	Height of haze level, expressed in feet.	Q	500	10M
51-60 F10.0	Percentage of rain area, expressed as a decimal fraction.	PPR	0	1

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Flight Descriptors Card Type: 19 Total Number This Type: 1

Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-5 I5	Time elapsed from mission inception, i.e., the interval when sensors are first turned on to the commencement of the first data collection pass (in tenths of seconds).	ITT	0	3600
6-10 I5	Number of passes. See paragraph 2.2 of AIRS, Volume I.	NPASS	1	5
11-15 I5	Code designating evasion pattern "0" or straight course "1".*	IIND	0 or 1	

* Evasion pattern has not been validated.

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Evasion Pattern Descriptors Card Type: 20 Total Number This Type: 1*

Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Amplitude of wave course, expressed as nautical miles.	AMPLTD	0	5
11-20 F10.0	Distance between zero crossings (half of the wave length), expressed as nautical miles.	DCROSS	0	5
21-30 F10.0	Minimum roll angle, expressed in degrees.	ROLLMN	1	89
31-40 F10.0	Maximum roll angle, expressed in degrees.	ROLLMX	1	89

*This card should be present in data deck only when IIND of card type 19 is set to "0".

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Additional Flight Descriptors	Card Type: 21	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-5 I5	The number of legs* for the first pass. Each pass must have at least two legs.	NLEG(1)	2	10
6-10 I5	The number of legs for the second pass.	NLEG(2)	2	10
.		.	.	
.		.	.	
I5	The number of legs for the last pass.**	NLEG(NPASS)**	2	10

*The last leg is always a turn or flight to base for the last pass, during which time all sensors are off.

**Assuming NPASS is not greater than 16. For more than 16 passes, a second card type 21 is required.

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Additional Flight Descriptors	Card Type: 22	Total Number This Type: *		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Latitude at the start of leg J of pass I expressed as AAA.BBCC where A is degrees, B is minutes, C is seconds. North is "+", South is "-".	XX(I,J)**	-90	90
11-20 F10.0	Longitude at the start of leg J of pass I expressed as AAA.BBCC as above. East is "+", West is "-".	YY(I,J)	-180	180
21-30 F10.0	Altitude for leg J of pass I, expressed as feet above mean ground level.	HH(I,J)	100	100K
31-40 I10	Duration of leg J of pass I, expressed in tenths of a second, e.g., 12 minutes is entered as "7200".	IT(I,J)	1	10K

*$\sum_{i=1}^{NPASS} NLEG_i$. This card type is repeated for each leg of each pass. See card types 19 and 21.

**"I" ranges from 1 through NPASS: "J" ranges from 1 through NLEG(I), e.g., the card representing the last leg of pass 1 should precede the card for leg 1 of pass 2.

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Navigation Descriptors	Card Type: 23	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Root mean square error in heading, expressed in radians.	ANAVHD	.0001	.01
11-20 I10	Code designating units of speed error: "0" if ANAVSP below is a constant expressed in knots, "1" if ANAVSP is a fraction of true speed.	INAVSP	0 or 1	
21-30 F10.0	Root mean square error in speed, expressed in knots or as a decimal fraction of true speed, depending upon INAVSP above.	ANAVSP	0	10
31-40 F10.0	Root mean square error in estimate of initial position, expressed in nautical miles.	ANAVPS	0	1
41-50 F10.0	Rate of position error as a function of time lapse from checkpoint, expressed in nautical miles per hour.	ANAVPR	0	10
51-60 I10	Navigation checkpoint interval, expressed in tenths of a second, e.g., five minutes is "3000".	ITCP	600	10K
61-70 F10.0	Root mean square error in estimate of altitude, expressed in feet.	ANAVHT	5	500

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Reliability of Sensors	Card Type: 24a	Total Number This Type:	
Columns & Format	Description of Field	Mnemonic	Range Low High
1-10 F10.0	Mean time between failures for sensor number 1, expressed in hours.	AMTBF(1)	10 1K
11-20 F10.0	Repeat for sensors 2 through 8.	AMTBF(2)	10 1K
21-30 F10.0		.	.
31-40 F10.0		.	.
41-50 F10.0		.	.
51-60 F10.0		.	.
61-70 F10.0		.	.
71-80 F10.0		AMTBF(8)	10 1K

TABLE 3-1. DATA DECK FOR SCENARIO (Continued)

Subject: Reliability of Sensors	Card Type: 24b	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Mean time between failure for sensor number 9, expressed in hours.	AMTBF(9)	10	1K
11-20 F10.0	Repeat for sensors 10 through 15.	AMTBF(10)	10	1K
21-30 F10.0		.	.	
31-40 F10.0		.	.	
41-50 F10.0		.	.	
51-60 F10.0		.	.	
61-70 F10.0		AMTBF(15)	10	1K

TABLE 3-2
DATA DECK FOR
EXECUTIVE

TABLE 3-2. DATA DECK FOR EXECUTIVE

Subject: Infrared Parameters	Card Type: 1a	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.5	Angular resolution of band 1 of the IR sensor expressed in radians.	RES(1)	10^{-4}	3
11-20 F10.5	Angular resolution of band 2 of the IR sensor expressed in radians.	RES(2)	10^{-4}	3
21-30 F10.5	Highest wavelength of band 1 of the IR sensor expressed in microns.	ALAM22(1)	1	20
31-40 F10.5	Highest wavelength of band 2 of the IR sensor expressed in microns.	ALAM22(2)	1	20
41-50 F10.5	Lowest wavelength of band 1 of the IR sensor expressed in microns.	ALAM21(1)	1	20
51-60 F10.5	Lowest wavelength of band 2 of the IR sensor expressed in microns.	ALAM21(2)	1	20
61-70 F10.5	Thermal resolution of band 1 of the IR sensor expressed in degrees Kelvin.	DTEMP(1)	10^{-2}	20
71-80 F10.5	Thermal resolution of band 2 of the IR sensor expressed in degrees Kelvin.	DTEMP(2)	10^{-2}	20

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: Infrared Parameters	Card Type: 1b	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.5	Variance of error in angular measurement for band 1 of the IR expressed in radians squared.	SIGTH1(1)	10^{-8}	.5
11-20 F10.5	Variance of error in angular measurement for band 2 of the IR expressed in radians squared.	SIGTH1(2)	10^{-8}	.5
21-30 F10.5	IR film "gamma" which is the slope of the linear portion of a curve resulting from plotting density against the log of exposure time (manufacturers' constant).	GAMMA2	.5	10
31-40 F10.5	Minimum detectable logarithmic contrast - generally assumed to be 2 percent - expressed as a decimal fraction.	C02	.01	.03

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: Infrared Parameters	Card Type: 1c	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Total field of view per sweep in direction of flight expressed in radians.	BMWDIR	10^{-4}	.5
11-20 F10.0	Period of rotation of the mirrors expressed in seconds (divided by number of facets if multifacets).	TROT	10^{-3}	12
21-25 I5	Number of separate IR detectors or arrays in the IR sensor, spaced around one 360° rotation.	NODTIR	1	20

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: Infrared Parameters	Card Type: 1d	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-5 I5	False alarm coefficient expressed as an integer between 5 and 12*.	IFALS2	5	12
6-10 I5	Code designating that level 1 of processing is desired, 1, or not desired, 0, for this run for this sensor (J).	ILEVEL(J,1)	0 or 1	
11-15 I5	Code designating that level 2 of processing is desired, 1, or not desired, 0, for this run for this sensor (J).	ILEVEL(J,2)	0 or 1	
16-20 I5	Code designating that level 3 of processing is desired, 1, or not desired, 0, for this run for this sensor (J).	ILEVEL(J,3)	0 or 1	
21-25 I5	Code designating that level 4 of processing is desired, 1, or not desired, 0, for this run for this sensor (J).	ILEVEL(J,4)	0 or 1	
26-30 I5	Code designating that a diagnostic printout is, 1, or is not, 0, desired for this sensor. This option is a debugging aid and is not ordinarily employed during normal use of the model.	JIR	0 or 1	

*The quantity is computed as $-\frac{1}{n}\log_{10}\frac{F}{B}$ where: B is system bandwidth which is equivalent to the product of display frequency and the number of distinguishable spots on the screen; n is the number of consecutive false spots constituting a false alarm; F is the acceptable false alarm rate expressed as false alarms per second. (Used for level 1 only; affects threshold for detection.)

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: Side-Looking Radar Parameters Card Type: 2a Total Number This Type: 1			
Columns & Format	Description of Field	Mnemonic	Range Low High
1-5 I5	Code designating type of processing: 1 for real aperture, 2 for synthetic aperture.	ISLRTP	1 or 2

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: Side-Looking Radar Parameters	Card Type: 2b	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Range resolution expressed in nautical miles.	HLITS	10^{-4}	1
11-20 F10.0	Depression angle to the top of the csc^2 beam valid area expressed in radians.	PHEMIS	10^{-3}	.5
21-30 F10.0	Wavelength of the radar expressed in centimeters.	ALAMDS	1	5
31-40 F10.0	System gamma which is the slope of the linear portion of the curve resulting from plotting $\log_{10}$ of density against $\log_{10}$ of power received.	GAMMAS	.1	2
41-50 F10.0	Minimum detectable logrithmic contrast -- generally assumed to be 2 percent -- expressed as a decimal fraction	COS	.01	.03
51-60 F10.0	Film resolution expressed as lines per millimeter.	ALIS	10	100
61-70 F10.0	Display (on board aircraft, level 1) resolution expressed as total number of line pairs.	ALIPS	1	1000

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: Side-Looking Radar Parameters Card Type: 2c Total Number This Type: 1

Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Half-width of film expressed in meters	D1	10^{-3}	.5
11-20 F10.0	Maximum slant range recorded on film expressed in meters.	RMAX	500	10^{5}
21-30 F10.0	Minimum slant range recorded on film expressed in meters.	RMIN	10^{2}	10^{4}
31-40 F10.0	Width of range shown on the display expressed in meters.	R1P	.1	10
41-50 F10.0	Variance of the error of the perceived azimuth angle expressed as randians squared.	SIGTSS	10^{-10}	10^{-3}

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: Side-Looking Radar Parameters Card Type: 2d Total Number This Type: 1				
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Cross range resolution available with synthetic aperture processing for level 1 expressed in nautical miles.*	AJ	10^{-3}	1
11-20 F10.0	Cross range resolution available with synthetic aperture processing for levels 2, 3, and 4*. (nautical miles)	AJ24	10^{-3}	1
21-30 F10.0	Antenna half-power beam width (azimuth plane) for real aperture processing expressed in radians**.	BETSLR	0	3

*Leave blank if real aperture processing is used.
**Leave blank if synthetic aperture processing is used.

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: Side-Looking Radar Parameters Card Type: 2e Total Number This Type: 1			
Columns & Format	Description of Field	Mnemonic	Range Low High
1-5 I5	Code designating that level 1 of processing is desired, 1, or not desired, 0, for this run for this sensor (J).	ILEVEL(J,1)	0 or 1
6-10 I5	Code designating that level 2 of processing is desired, 1, or not desired, 0, for this run for this sensor (J).	ILEVEL(J,2)	0 or 1
11-15 I5	Code designating that level 3 of processing is desired, 1, or not desired, 0, for this run for this sensor (J).	ILEVEL(J,3)	0 or 1
16-20 I5	Code designating that level 4 of processing is desired, 1, or not desired, 0, for this run for this sensor (J).	ILEVEL(J,4)	0 or 1
21-25 I5	Code designating that a diagnostic printout is desired, 1, or is not desired, 0, for this sensor.	JSLR	0 or 1

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: MTISLR Parameters	Card Type: 3a	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Cross range resolution expressed in meters.	DX	5	50
11-20 F10.0	Slant range resolution expressed in meters.	DR	5	50
21-30 F10.0	Depression angle to the top of the beam expressed in radians.	PHE4	10^{-3}	1
31-40 F10.0	Wavelength of radar expressed in centimeters.	ALAMD4	1	10
41-50 F10.0	Variance in the error in the perceived azimuth angle expressed in radians squared.	SIGTS4	10^{-8}	10^{-5}
51-60 F10.0	Threshold probability of detection below which target cannot be detected expressed as a decimal fraction. (See paragraph 3.2.3.2 of AIRS, Volume I.)	PDC4	0	1

TABLE 3-2. DATA DECK FOR EXECUTIVE

Subject: MTISLR Parameters Card Type: 3b* Total Number This Type: 1

Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-8 F8.0	Horizontal beamwidth of radar expressed in degrees.	A101	.5	10
9-16 F8.0	Peak pulse power expressed in kilowatts.	A301	1	100
11-24 F8.0	Pulse compression ratio.	A302	10	10^3
25-32 F8.0	Antenna efficiency expressed as a percent -- a number between 0 and 100.	A303	0	100
33-40 F8.0	Sweep integration factor. See page 5-21 of Analytics Technical Report 1010-1.	A304	10	100
41-48 F8.0	Pulse repetition period expressed in milliseconds.	A901	1	10^3
49-56 F8.0	Number of delay lines, between 1 and 5.	A902	1	5
57-64 F8.0	Terminal vertical velocity of rain expressed in nautical miles per hour.	B603	10	100

*Card 3b is continued on next page.

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: MTISLR Parameters	Card Type: 3b	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
65-72 F8.0	Receiver subsystem noise figure expressed in decibels.	C101	1	30
73-80 F8.0	Effective system bandwidth expressed in megahertz.	C102	50	200

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: MTISLR Parameters	Card Type: 3c	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-5 I5	False alarm coefficient expressed as an integer between 5 and 12.*	IFALS4	5	12
6-10 I5	Code designating that level 1 of processing is desired, 1, or not desired, 0, for this run for this sensor (J).	ILEVEL(J,1)	0 or	1
11-15 I5	Code designating that level 2 of processing is desired, 1, or not desired, 0, for this run for this sensor (J).	ILEVEL(J,2)	0 or	1
16-20 I5	Code designating that level 3 of processing is desired, 1, or not desired, 0, for this run for this sensor (J).	ILEVEL(J,3)	0 or	1
21-25 I5	Code designating that level 4 of processing is desired, 1, or is not desired, 0, for this sensor (J)	ILEVEL(J,4)	0 or	1
26-30	Code designating that a diagnostic printout is desired, 1, or is not desired, 0, for this sensor. This option is a debugging aid and is not ordinarily employed during normal use of the model.	JMSLR	0 or	1

*The quantity is computed as $-\frac{1}{n}\log_{10}\frac{F}{B}$ where: B is system bandwidth which is equivalent to the product of display frequency and the number of distinguishable spots on the screen; n is the number of consecutive false spots constituting a false alarm; F is the acceptable false alarm rate expressed as false alarms per second.

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: MTIFLR Parameters	Card Type: 4a	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Wavelength of the radar expressed in centimeters.	ALAMDA	1	10
11-20 F10.0	Threshold probability of detection below which target cannot be identified expressed as a decimal fraction. (See paragraph 3.2.4.3 of AIRS, Volume I.)	PDC5	.7	1
21-30 F10.0	Sweep integration factor. See page 5-21 of Analytics Technical Report 1010.1	SIF	10	100
31-40 F10.0	Standard deviation of the error of the perceived azimuth angle expressed in radians.	SIGT	.01	.1

TABLE 3-2. DATA DECK FOR SCENARIO (Continued)

Subject: MTIFLR Parameters	Card Type: 4b*	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-8 F8.0	Number of delay lines, between 1 and 5.	AA02	1	5
9-16 F8.0	Terminal vertical velocity of rain expressed in nautical miles per hour.	AA03	10	100
17-24 F8.0	Receiver subsystem noise figure expressed in decibels.	AA04	1	30
25-32 F8.0	Receiver bandwidth expressed in megahertz.	AA05	1	100
33-40 F8.0	Antenna efficiency expressed as percent -- a number between 0 and 100.	AA07	1	99
41-48 F8.0	Pulse compression ratio.	AA08	1	100
49-56 F8.0	Peak pulse power expressed in kilowatts.	AA09	10	10^3
57-64 F8.0	Slant range resolution expressed in meters.	AA11	1	100

*Card 4b is continued on next page.

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: MTIFLR Parameters	Card Type: 4b	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
65-72 F8.0	Cross range resolution expressed in meters.	AA12	1	100
73-80 F8.0	Pulse repetition period expressed in milliseconds.	AA13	10^{-2}	1

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: MTIFLR Parameters	Card Type: 4c	Total Number This Type: 1	

Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-5 I5	False alarm coefficient expressed as an integer between 5 and 12*.	IFALSE	5	12
6-10 I5	Code designating that level 1 of processing is desired, 1, or not desired, 0, for this run for this sensor (J).	ILEVEL(J,1)	0 or	1
11-15 I5	Code designating that level 2 of processing is desired, 1, or not desired, 0, for this run for this sensor (J).	ILEVEL(J,2)	0 or	1
16-20 I5	Code designating that level 3 of processing is desired, 1, or not desired, 0, for this run for this sensor (J).	ILEVEL(J,3)	0 or	1
21-25 I5	Code designating that level 4 of processing is desired, 1, or not desired, 0, for this run for this sensor (J).	ILEVEL(J,4)	0 or	1
26-30 I5	Code designating that a diagnostic printout is desired, 1, or is not desired, 0, for this sensor. This option is a debugging aid and is not ordinarily employed during normal use of the model.	JMFLR	0 or	1

*The quantity is computed as $-\frac{1}{n} \log_{10} \frac{F}{B}$ where: B is system bandwidth which is equivalent to the product of display frequency and the number of distinguishable spots on the screen; n is the number of consecutive false spots constituting a false alarm; F is the acceptable false alarm rate expressed as false alarms per second.

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: ECM Parameters	Card Type: 5a	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Ratio of the standard deviation of the precision in angular measurement (radians) versus beamwidth (radians) expressed as a decimal fraction.	A	0	1
11-20 F10.0	Variance of error in aircraft heading as computed by the navigational system expressed in radians squared.	SIGTS	10^{-8}	10^{-5}
21-30 F10.0	Variance in error in aircraft velocity expressed in nautical miles per hour squared.	SIGVS	.01	5
31-40 F10.0	Threshold frequency below which it is not possible to ascertain an angular fix on the target, expressed in megahertz.	FREQ1	1	200
41-50 F10.0	Receiver noise figure expressed in decibels.	ANF	1	30
51-60 F10.0	Receiver bandwidth expressed in megahertz.	BAND	1	10

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: ECM Parameters	Card Type: 5b	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-5 I5	The number of receiving channels expressed as an integer.	NRECM	1	20
6-15 F10.0	Maximum rate of signal processing expressed in pulses per second.	RPECM	10^3	10^5
16-25 F10.0	Instantaneous receiver bandwidth expressed in megahertz.	B1ECM	1	10
26-35 F10.0	Total frequency range covered by the system expressed in megahertz.	B2ECM	10^3	10^5

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: ECM Parameters Card Type: 5c Total Number This Type: 1

Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-5 I5	Number of beams expressed as an integer. See paragraph 3.2.6 (page 3-59) of reference 1.	NBEAM	1	50
6-10 I5	The number of points required to characterize the gain of the antenna as it varies with frequency, expressed as an integer no greater than 20. (The function is assumed to be linear between points so the user need provide only enough points to define each line segment.)	ITABM	1	20
11-15 I5	Code designating that level 1 of processing is desired, 1, or not desired, 0, for this run for this sensor (J).	ILEVEL(6,1)	0 or 1	
16-20 I5	Code designating that level 2 of processing is desired, 1, or not desired, 0, for this run for this sensor (J).	ILEVEL(6,2)	0 or 1	
21-25 I5	Code designating that level 3 of processing is desired, 1, or not desired, 0, for this run for this sensor (J).	ILEVEL(6,3)	0 or 1	
26-30 I5	Code designating that level 4 of processing is desired, 1, or not desired, 0, for this run for this sensor (J).	ILEVEL(6,4)	0 or 1	
31-35 I5	Code designating that a diagnostic printout is desired, 1, or is not desired, 0, for this sensor. This option is a debugging aid and is not ordinarily employed during normal use of the model.	JECM	0 or 1	

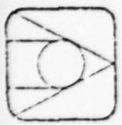


TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: ECM Parameters	Card Type: 5d	Total Number This Type: ITABM*		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	X-coordinate of a point required to characterize the ECM gain functions. This is the frequency expressed in megahertz.	XTAB	0	10^5
11-20 F10.0	Y-coordinate of the same point. This is the receiver antenna gain plus line losses, experienced at frequency "XTAB", expressed in decibels.	YTAB	-50	50

*see card type 5c.

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: Photographic Parameters	Card Type: 6a	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	The fraction of keyed photos from this camera which are transmitted to the ground station, expressed as a decimal.	Q(1)	0	1
11-20 F10.0		Q(2)	0	1
21-30 F10.0		Q(3)	0	1
31-40 F10.0		Q(4)	0	1
41-50 F10.0		Q(5)	0	1
51-60 F10.0		Q(6)	0	1
61-70 F10.0		Q(7)	0	1
71-80 F10.0		Q(8)	0	1

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: Photographic Parameters	Card Type: 6b	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Display (level 1, on board the aircraft) or scanner (level 2, transmitted to ground) resolution for this photo sensor expressed in line pairs per millimeter.	ALIP(1)	1	1000
11-20 F10.0		ALIP(2)	1	1000
21-30 F10.0		ALIP(3)	1	1000
31-40 F10.0		ALIP(4)	1	1000
41-50 F10.0		ALIP(5)	1	1000
51-60 F10.0		ALIP(6)	1	1000
61-70 F10.0		ALIP(7)	1	1000
71-80 F10.0		ALIP(8)	1	1000

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: Photographic Parameters	Card Type: 6c	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Film resolution for this camera expressed in optical lines per millimeter.	AL1(1)	1	2000
11-20 F10.0		AL1(2)	1	2000
21-30 F10.0		AL1(3)	1	2000
31-40 F10.0		AL1(4)	1	2000
41-50 F10.0		AL1(5)	1	2000
51-60 F10.0		AL1(6)	1	2000
61-70 F10.0		AL1(7)	1	2000
71-80 F10.0		AL1(8)	1	2000

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: Photographic Parameters	Card Type: 6d	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Effective lens resolution, taking into account vibration, noise, turbulent airflow, etc., for this camera, expressed in optical lines per millimeter.	AL2(1)	1	1000
11-20 F10.0		AL2(2)	1	1000
21-30 F10.0		AL2(3)	1	1000
31-40 F10.0		AL2(4)	1	1000
41-50 F10.0		AL2(5)	1	1000
51-60 F10.0		AL2(6)	1	1000
61-70 F10.0		AL2(7)	1	1000
71-80 F10.0		AL2(8)	1	1000

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: Photographic Parameters	Card Type: 6e	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Focal length of the lens of this camera expressed in inches.	F(1)	1	100
11-20 F10.0		F(2)	1	100
21-30 F10.0		F(3)	1	100
31-40 F10.0		F(4)	1	100
41-50 F10.0		F(5)	1	100
51-60 F10.0		F(6)	1	100
61-70 F10.0		F(7)	1	100
71-80 F10.0		F(8)	1	100

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: Photographic Parameters	Card Type: 6f	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Logarithmic scale of the film or display for this camera. (Log of ratio of max:min density or contrast.)	D(1)	1	10
11-20 F10.0		D(2)	1	10
21-30 F10.0		D(3)	1	10
31-40 F10.0		D(4)	1	10
41-50 F10.0		D(5)	1	10
51-60 F10.0		D(6)	1	10
61-70 F10.0		D(7)	1	10
71-80 F10.0		D(8)	1	10

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: Photographic Parameters	Card Type: 6g	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Minimum detectable logarithmic contrast for this camera. Generally taken to be 2 percent, expressed as a decimal fraction.	C0(1)	.01	.05
11-20 F10.0		C0(2)	.01	.05
21-30 F10.0		C0(3)	.01	.05
31-40 F10.0		C0(4)	.01	.05
41-50 F10.0		C0(5)	.01	.05
51-60 F10.0		C0(6)	.01	.05
61-70 F10.0		C0(7)	.01	.05
71-80 F10.0		C0(8)	.01	.05

TABLE 3-2. DATA DECK FOR EXECUTIVE

Subject: Photographic Parameters	Card Type: 6h	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Film or display gamma for this camera, which is the slope of the linear portion of a curve resulting from plotting density against the $\log_{10}$ of exposure time.	GAMMA(1)	.5	2
11-20 F10.0		GAMMA(2)	.5	2
21-30 F10.0		GAMMA(3)	.5	2
31-40 F10.0		GAMMA(4)	.5	2
41-50 F10.0		GAMMA(5)	.5	2
51-60 F10.0		GAMMA(6)	.5	2
61-70 F10.0		GAMMA(7)	.5	2
71-80 F10.0		GAMMA(8)	.5	2

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: Photographic Parameters	Card Type: 6i	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	The distance between this camera and the electronic flasher (used only at night) expressed in meters.	DIS(1)	.5	10
11-20 F10.0		DIS(2)	.5	10
21-30 F10.0		DIS(3)	.5	10
31-40 F10.0		DIS(4)	.5	10
41-50 F10.0		DIS(5)	.5	10
51-60 F10.0		DIS(6)	.5	10
61-70 F10.0		DIS(7)	.5	10
71-80 F10.0		DIS(8)	.5	10

TABLE 3-2. DATA DECK FOR EXECUTIVE

Subject: Photographic Parameters	Card Type: 6j	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Minimum range at which backscatter occurs for this camera, expressed in meters.	RO(1)	.5	100
11-20 F10.0		RO(2)	.5	100
21-30 F10.0		RO(3)	.5	100
31-40 F10.0		RO(4)	.5	100
41-50 F10.0		RO(5)	.5	100
51-60 F10.0		RO(6)	.5	100
61-70 F10.0		RO(7)	.5	100
71-80 F10.0		RO(8)	.5	100

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: Photographic Parameters	Card Type: 6k	Total Number This Type: 1		
Columns & Format	Description of Field		Mnemonic	Range Low High
1-2 I2	Code designating that level 1 of processing is desired, 1, or is not desired, 0.		ILEVEL(J,1)	0 or 1
3-4 I2	Repeat for levels 2 through 4.		ILEVEL(J,2)	0 or 1
5-6 I2	Repeat for levels 2 through 4.		ILEVEL(J,3)	0 or 1
7-8 I2	Repeat for levels 2 through 4.		ILEVEL(J,4)	0 or 1
9-64 I2	Repeat for cameras 2 through 8. J is the sensor number.		ILEVEL(J,K)	0 or 1
65-66 I2	Code designating that a diagnostic printout will be, 1, or will not be, 0, generated for cameras. This option is a debugging aid and is not ordinarily employed during normal use of the model.		JPHOTO	0 or 1

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: Forward-Looking Infrared Parameters Card Type: 7a Total Number This Type: 1				
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	Angular resolution for band 1 of the FLIR sensor, expressed in radians.	ANGRES(1)	10^{-2}	3
11-20 F10.0	Angular resolution forband 2, expressed in radians.	ANGRES(2)	10^{-2}	3
21-30 F10.0	Highest wavelength of band 1, expressed in microns.	HLAMDA(1)	1	20
31-40 F10.0	Highest wavelength of band 2, expressed in microns.	HLAMDA(2)	1	20
41-50 F10.0	Lowest wavelength of band 1, expressed in microns.	BLAMDA(1)	1	20
51-60 F10.0	Lowest wavelength of band 2, expressed in microns.	BLAMDA(2)	1	20
61-70 F10.0	Thermal resolution of band 1, expressed in degrees Kelvin.	TEMRES(1)	10^{-2}	20
71-80 F10.0	Thermal resolution of band 2, expressed in degrees Kelvin.	TEMRES(2)	10^{-2}	20

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: Forward-Looking Infrared Parameters Card Type: 7b Total Number This Type: 1				
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.5	Variance in the error of the angular measurement of band 1 of the FLIR sensor expressed in radians squared.	ANGVAR(1)	10^{-8}	10^{-2}
11-20 F10.5	Variance in the error of the angular measurement of band 2 expressed in radians squared.	ANGVAR(2)	10^{-8}	10^{-2}
21-30 F10.5	IR film gamma which is the slope of the linear portion of a curve relating density to the log of exposure time.	SYSGAM	.5	10
31-40 F10.5	Minimum detectable logarithmic contrast. Generally considered to be 2 percent, expressed as a decimal fraction.	AMDLC	.01	.05

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: Forward-Looking Infrared Parameters Card Type: 7c Total Number This Type: 1			
Columns & Format	Description of Field	Mnemonic	Range Low High
1-10 F10.0	Total field of view per sweep in direction of flight expressed in radians.	BEMWID	10^{-4} .5
11-20 F10.0	The period of rotation of the mirrors expressed in seconds. (Divided by number of facets if multifacets.)	PERIOD	10^{-3} 12
21-25 I5	The number of detectors in the sensor.	NUMDET	1 20

TABLE 3-2. DATA DECK FOR EXECUTIVE (Continued)

Subject: Forward-Looking Infrared Parameters Card Type: 7d Total Number This Type: 1			
Columns & Format	Description of Field	Mnemonic	Range Low High
1-5 I5	False alarm coefficient expressed as an integer between 5 and 12*.	IFAL 15	5 12
6-10 I5	Code designating that level 1 of processing is desired, 1, or not desired, 0, for this run for this sensor (J).	ILEVEL(J,1)	0 or 1
11-15 I5	Code designating that level 2 of processing is desired, 1, or not desired, 0, for this run for this sensor (J).	ILEVEL(J,2)	0 or 1
16-20 I5	Code designating that level 3 of processing is desired, 1, or not desired, 0, for this run for this sensor (J).	ILEVEL(J,3)	0 or 1
21-25 I5	Code designating that level 4 of processing is desired, 1, or not desired, 0, for this run for this sensor (J).	ILEVEL(J,4)	0 or 1
26-30 I5	Code designating that a diagnostic printout is desired, 1, or is not desired, 0, for this sensor. This option is a debugging aid and is not ordinarily employed during normal use of the model.	JFLIR	0 or 1

*The quantity is computed as $-\frac{1}{n}\log_{10}\frac{F}{B}$ where: B is system bandwidth which is equivalent to the product of display frequency and the number of distinguishable spots on the screen; n is the number of consecutive false spots constituting a false alarm; F is the acceptable false alarm rate expressed as false alarms per second.

TABLE 3-3
DATA DECK FOR
EVAL

TABLE 3-3. DATA DECK FOR EVAL

Subject: Target Type and Print On/Off Card Type: 1 Total Number This Type: 1			
Columns & Format	Description of Field	Mnemonic	Range Low High
1-30 30I1	A 0 (or blank) in the J^{th} column turns target type J "off"; that is, all sightings of targets of type J are excluded from the computations. A 1 in the J^{th} column indicates that target type J is "on". Any punch other than a 0 (or blank) or a 1 in column J produces an error message and causes EVAL to abort. J=1,30	IHOLD(J) J=1, 30	0 or 1
72 I1	A 0 (or blank) in this column causes suppression of all output of target type tables except for type 31, which is the final summary table. A 1 in the column allows the tables to be printed. Note that this affects only the printing of results, not the computation. Any punch other than a 0 (or blank) or a 1 in this column produces an error message and causes EVAL to abort.	IPRINT	0 or 1

TABLE 3-3. DATA DECK FOR EVAL (Continued)

Subject: Alphanumeric Header	Card Type: 2	Total Number This Type: 1	

Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-72 18A4	Up to 72 characters of alphanumeric header. This header will be printed each iteration, and thus this card should be changed for each iteration to provide iteration identification. Any punches in columns 73 to 80 will be ignored.	LABEL	ALPHA/ NUMERIC	

TABLE 3-3. DATA DECK FOR EVAL (Continued)

Subject: Sensor On/Off	Card Type: 3	Total Number This Type: 1	
Columns & Format	Description of Field	Mnemonic	Range Low High
1-15 1X,14I1	A 0 (or blank) in the K^{th} column turns sensor K off; that is, all sensor K measures are zeroed and overall system measures are reduced accordingly. A 1 in the K^{th} column indicates that sensor K is on. Any punch other than a 0 (or blank) or a 1 in column K produces an error message and causes EVAL to abort. K=2,15. The punch in column 1 is ignored.	ISEN(K) K=2,15	0 or 1

TABLE 3-3. DATA DECK FOR EVAL (Continued)

Subject: Maximum Offset Distance	Card Type: 4	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-10 F10.0	The maximum offset distance, expressed in nautical miles, is punched in free format anywhere in the first 10 columns. Decimal point must be included. Any target sighting with an offset distance greater than this maximum offset distance will be excluded from the processing. That is, this offset distance assigns a swath of responsibility to the reconnaissance system.	AMAXOF	1	100

TABLE 3-3. DATA DECK FOR EVAL (Continued)

Subject: Target Group Definition	Card Type: 5	Total Number This Type: 5*		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-2 I2	On the J^{th} card of this card type, this field is the total number of target types included in target group J. J=1,5 For a definition of Target Group, see "Evaluation Routine" pages 4-3 and 4-4 (1).	NUM(J) J=1,5	0	30
11-70 30I2	On the J^{th} card of this card type, these fields are the identifying type numbers of the target types included in target group J. J=1,5. There should be exactly NUM(J) of these identifying numbers. If there are more, the excess is simply ignored; if there are fewer, EVAL will consider the target group to consist of just those types listed. In order to alert the user to this condition, the value of NUM(J) will not be changed so that the output will show a discrepancy between NUM(J) and the number of types listed as being in group J (see Section III).	NTY(J,N) N=1,NUM(J) J=1,5	0	30

*Card types 1-5 (9 cards) constitute 1 EVAL data pack. Data packs may be nested. A blank card must be placed after the last data pack.

TABLE 3-4
DATA DECK FOR
PREPROC

TABLE 3-4. DATA DECK FOR PREPROC

Subject: Deck Name Card	Card Type: 1	Total Number This Type: *	
Columns & Format	Description of Field	Mnemonic	Range Low High
1-80 (A10)	Type of data deck which follows this card: SCENARIO or EXECUTIVE or EVAL. Left justified.	DNAME	SCENARIO or EXECUTIVE OR EVAL

*One deck name card should be prepared for each data deck to be checked by PREPROC.

TABLE 3-4. DATA DECK FOR PREPROC (Continued)

Subject: Data Cards to be Checked	Card Type: 2	Total Number This Type: *	
Columns & Format	Description of Field	Mnemonic	Range Low High
	SCENARIO, EXECUTIVE, OR EVAL DATA DECKS*.		

*These cards are exactly as specified by Table 3-1, 3-2 or 3-3.

AD-A039 576 ANALYTICS INC WILLOW GROVE PA F/G 15/4
THE AIRS CDC-6600 USER'S GUIDE.(U)
MAY 74 P L LEWIN, S F MARTIN N62269-74-C-0692
UNCLASSIFIED 1120-A NL

2 OF 2
AD A039576

END
DATE FILMED
6-77

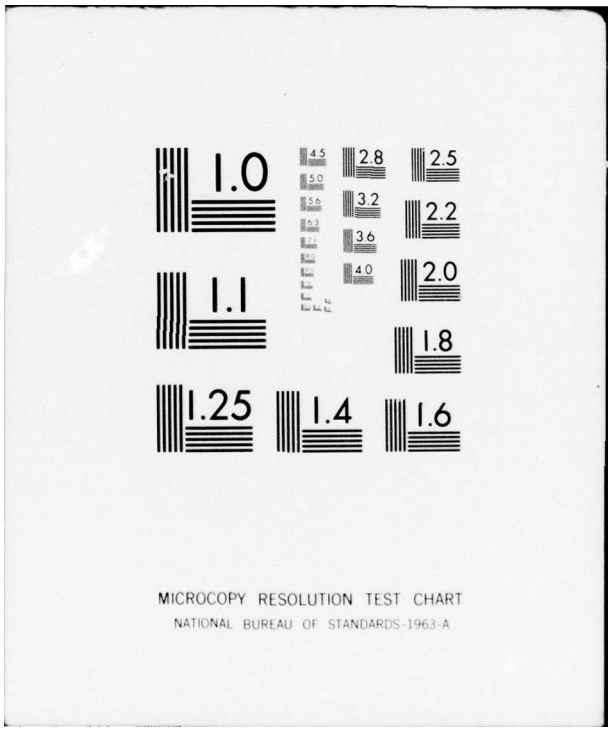

1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
6.3
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

TABLE 3-4. DATA DECK FOR PREPROC (Continued)

Subject: PREPROC Data End Card	Card Type: 3	Total Number This Type: 1		
Columns & Format	Description of Field	Mnemonic	Range Low	Range High
1-3 (A10)	END. Indicates to PREPROC that no more data decks follow.	DNAME	END	

IV. EVAL

4.1 OVERVIEW

The EVAL routine is a computer program that prints AIRS effectiveness measures. This user's guide provides all the information necessary for the execution of EVAL, but the user will find it helpful if he has knowledge of the AIRS simulation in general and in particular has read "Evaluation Routine", Section IV of reference 2* Since the publication of reference 2, sensor removal, target type output suppression and target identifiability redundancy computation capabilities have been added to the program and are explained in this section.

Sensor removal means that any combination of sensors may be "turned off" during EVAL computations -- i.e., EVAL will print answers as if the "off" sensors simply were not included on the reconnaissance aircraft. Previously, EVAL was limited to treating exactly those sensors which were "turned on" in the SCENARIO and

*"Evaluation Routine" supersedes all earlier descriptions of the EVAL program.

EXEC programs. Target type output suppression will be explained later. Target identifiability redundancy computation consists of calculating the beta measure using target identifiability probabilities*

The remainder of this section contains a discussion of the necessary user input, a description of printed program output and directions for job setup.

4.2 INPUT

The EVAL program requires two input sources as illustrated in Figure 2-1. The first is the TAPE2 output File of EXECUTIVE. This file contains the individual sighting results (computed by EXEC) that are to be processed and printed by EVAL**

The second input source allows the user some control over processing and printing. This source takes the form of user option parameters input by the user on punched cards. It takes nine cards to completely specify these parameters, and no card may be left out. A nine card set of input cards of EVAL, then, will be called a data pack. Basically, the parameters set by a data pack allow the user to:

- Exclude particular target types from processing;
- Exclude particular sensors from processing;
- Assign a responsibility swath to the reconnaissance flight;

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*Details on the beta measure may be found in Appendix F of reference 1.

**For a detailed description of the file's content and record format, see Section 7.3.2.1 of reference 2.

- Group target types together in a variety of ways and obtain summary effectiveness measures for these particular groupings;
- Suppress the printing of summary tables for individual target types; and
- Give EVAL output appropriate titles.

The input parameters needed to accomplish these tasks are shown, along with the format and order of the data pack, in Table 3-3.

4.3 OUTPUT

The output of the EVAL program consists of the following page types, in order:

(1) One header page;

(2) One page for each "on" target type, if the user so desires, giving type summary statistics;

(3) One page of overall summary statistics (integrated over all target types);

(4) One page for each group* (with a non-zero number of targets) giving group statistics;

(5) One page each for the sighting detectability beta measure, and the target detectability beta measure; and the target identifiability beta measure;

(6) One page giving non-zero detection probability statistics.

4.3.1 Page Type 1

Page type 1 contains, in the following order:

*see Table III.

(1) The run title as input by the user through variable LABEL on input card type 2;

(2) The maximum allowed offset distance as input by user through variable AMAXOF on input card type 4;

(3) The total number of target types "turned on", and the identifying number of each "on" type (target types are specified as "on" or "off" by the user through variable IHOLD on input card type 1);

(4) The total number of sensors "turned off", and the identifying number of each "off" sensor (sensors are specified as "on" or "off" by the user through variable ISEN on input card 3);

(5) For each of five target groups, the number of target types in the particular group along with the identifying number of each type (a discrepancy between these outputs indicates an error in input card type 5, numbers 5 to 9); and

(6) The title as originally inputted to SCENARIO. (Table 3-1, card 1).

4.3.2 Page Type 2

One page of type 2 is printed for each "on" target type if the user has set IPRINT equal to 1 on input card type 1. If IPRINT equals 0, all such pages are deleted from the output. Pages of type 2 and other pages described later contain data for "targets" and "sightings". For an explanation of these "target units" and "sighting units" see "Evaluation Routine"[2], page 4-2. Refer also to "Evaluation Routine", pages 4-12 to 4-15 for detailed explanations of the "numbered data items" used below. Each page of type 2 contains, in the following order:

(1) The identifying number of the type being summarized;

(2) The CEP of automatic keying (in feet) and its associated probability; the geodetic

CEP (in feet) and its associated probability; the navigational CEP, in nautical miles (all these are in sighting units);

(3) The same in target units;

(4) *The number of sightings being considered (i.e., the number included in the SCENARIO and within the user set maximum offset distance) in the target types; the number of targets being considered in the target type; the number of considered sightings that fell within the field of view of at least one sensor; the number of considered targets that fell within the field of view of at least one sensor (the first two of these data items are labeled "NUMBER"; the second two "OPPORTUNITIES");

(5) The integrated data combined over sensors, in sighting units broken out by level: that is, the detection probability (detectability), identification probability (identifiability), relative CEP, and total CEP for the system taking into account the performance of all "on" sensors for levels 1, 2, 3 and 4;

(6) The same is then given in target units; these are "data items" (9), (10), (11) and (12).

(7) For targets, the number seen in the field of view; the probability of line-of-sight (i.e., probability of the target not being masked by terrain); the equipment up probability; the no-cloud (i.e., not being obscured by clouds) probability; the relative CEP; and the expected number detected and identified in each level is given for every sensor 2 to 15: sensors that are turned "off" have these "data items" zeroed; these data items comprise: (1a), (2a), (3a), (4a), (5a), (6a) and (7a); and

(8) The same for sightings; these are data items (1b), (2b), (3b), (4b), (5b), (6b) and (7b).

All these items on pages of type 2 are clearly labeled.

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* See page A-5 for a more detailed explanation.

4.3.3 Page Type 3

The overall summary page, page type 3, has exactly the same format as page type 2. Page type 3 is titled "Target Type 31." Since there are only 30 allowed target types, type number 31 is used throughout the program to indicate overall (i.e., accumulated overall "on" target types) system measures.

4.3.4 Page Type 4

One page type 4 is printed for every target group containing at least one type with a non-zero number of considered targets. Each type 4 page lists the detectability, identifiability and mean CEP, broken out by level first in sighting units and then in target units. The total numbers (across all types within the group) of considered sightings and targets are also given.

4.3.5 Page Type 5

The three type 5 pages have identical format. They list in tabular arrays the appropriate redundancy (beta) measures for every sensor (2 to 15) at each of the four processing levels. The first page gives the beta measure calculated from sighting detectabilities, the second from target detectabilities, and the third from target identifiabilities. The user should note that the printed beta measures are a result of complex calculations; thus roundoff error is bound to occur. Numbers output as 1.004 or .9986 should be taken as simply 1.0. The sighting detectability beta measure of a particular sensor at a given level is the percentage (decimal) of overall system target sighting detections that would be lost (at that level) if the sensor were removed. The other two beta measures can be similarly interpreted. Thus, the user can evaluate simple sensor tradeoffs merely by looking at the three page type 5 outputs. More complex tradeoffs can be investigated by

turning off individual or sets of sensors through the use of the input variable ISEN*.

4.3.6 Page Type 6

Lastly, page type 6 lists, in each of the four levels, the number of considered sightings and the number of considered targets with non-zero detectabilities.

*For more details on using beta measures, see Appendix F, reference 1.

V. FLOW CHARTS

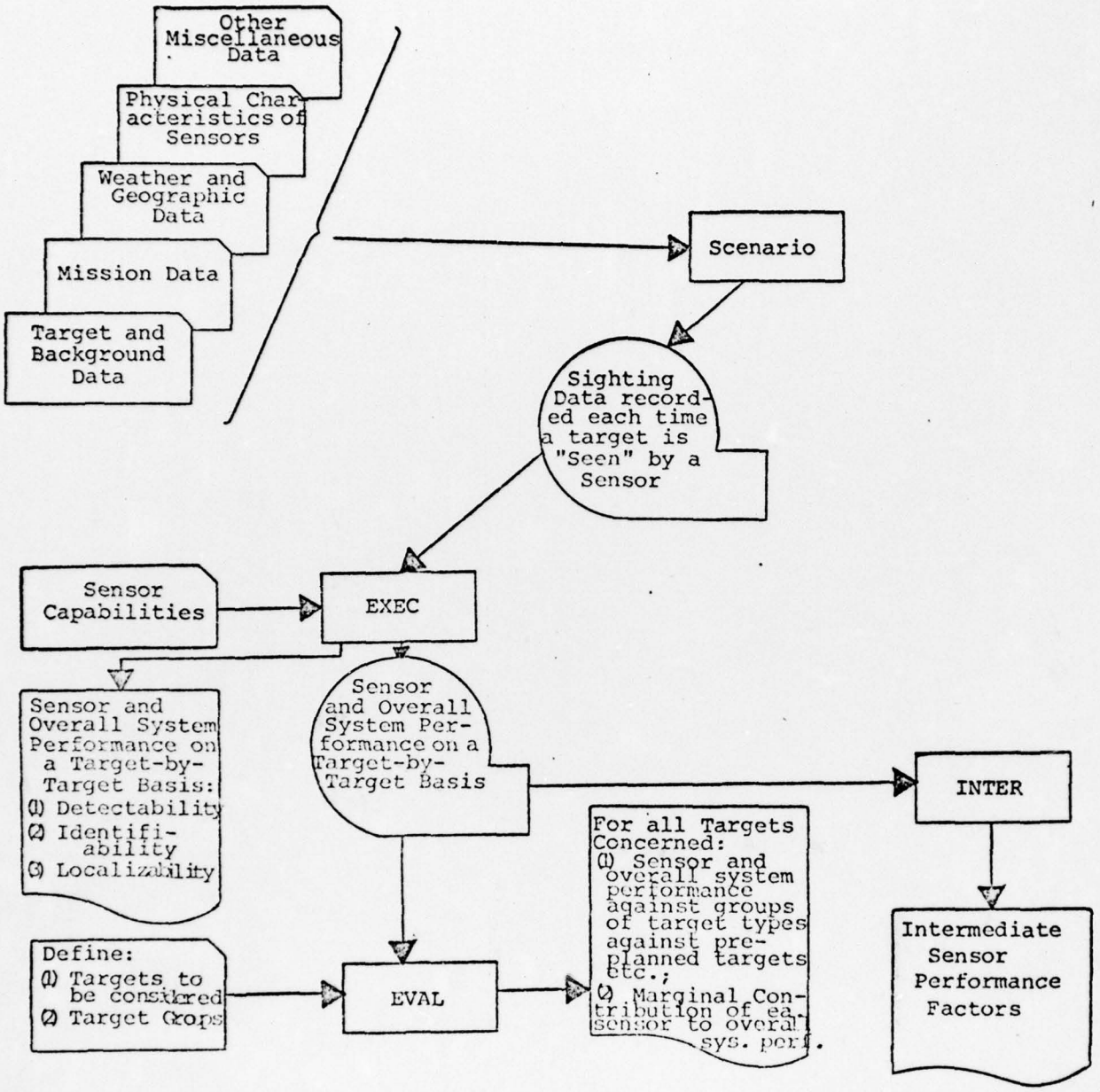

Figure 5-1. Flow Diagram of the AIRS Model

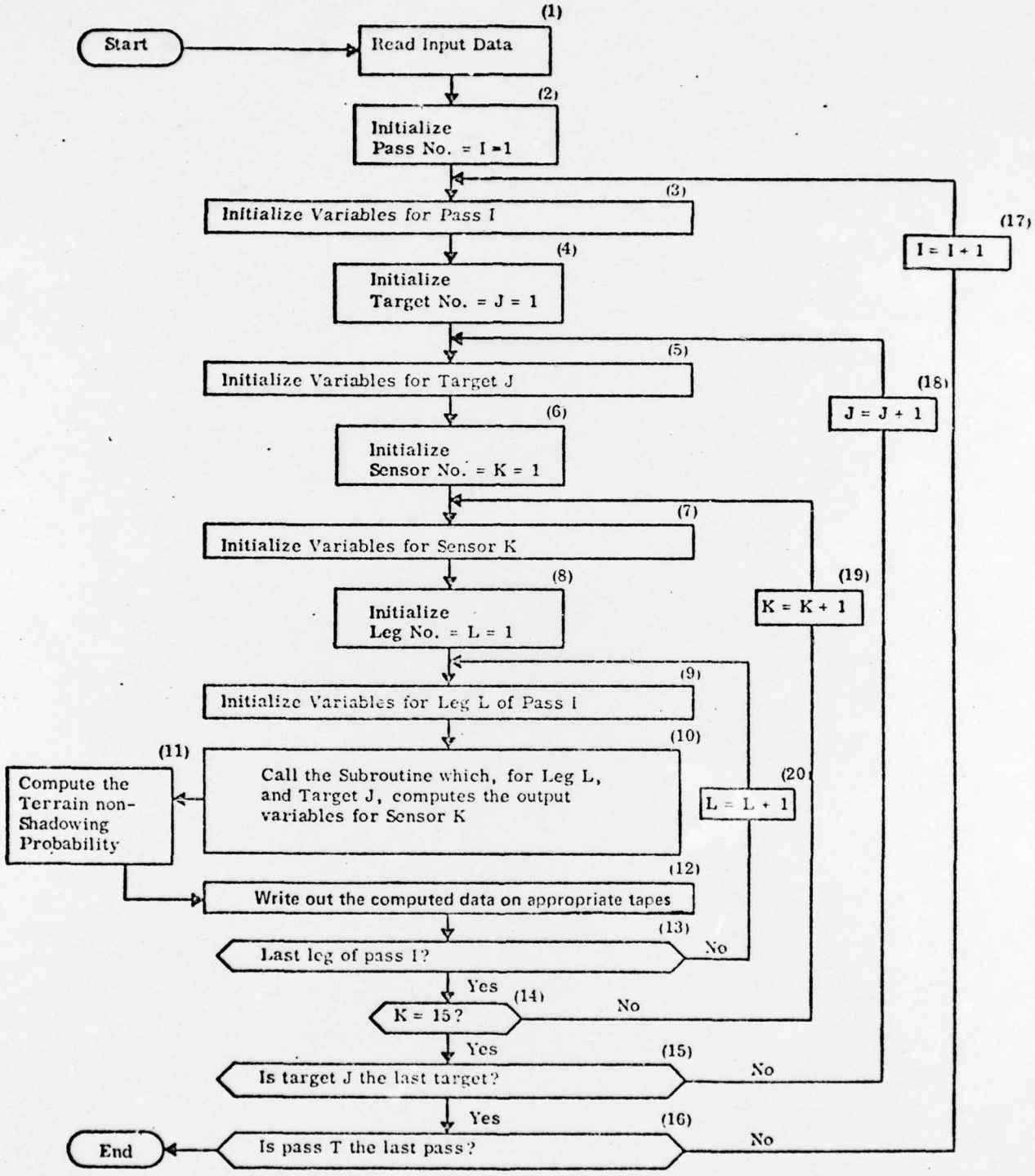

Figure 5-2. Flow Chart of SCENARIO

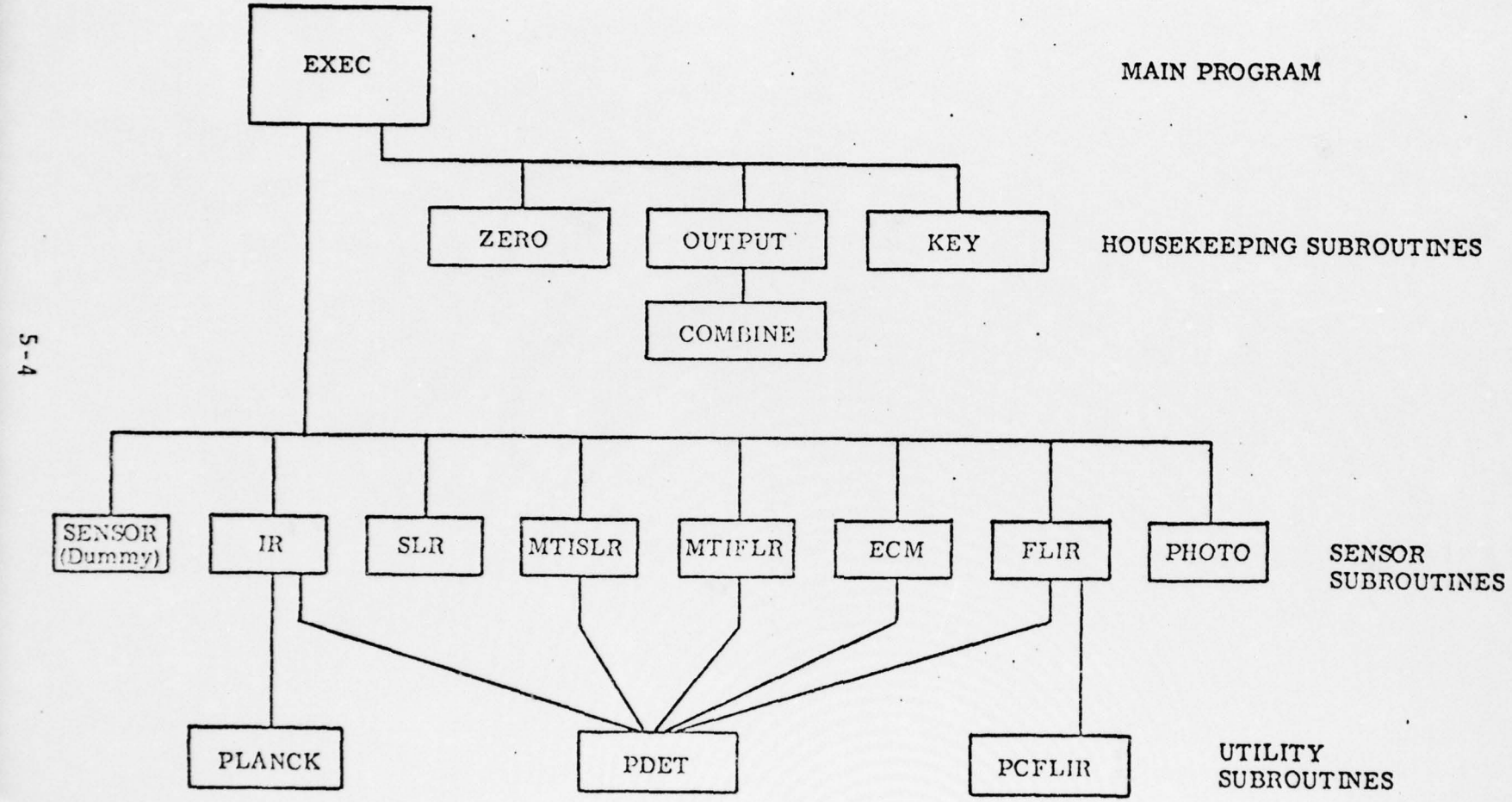

Figure 5-3. EXECUTIVE Model Program and Subroutines

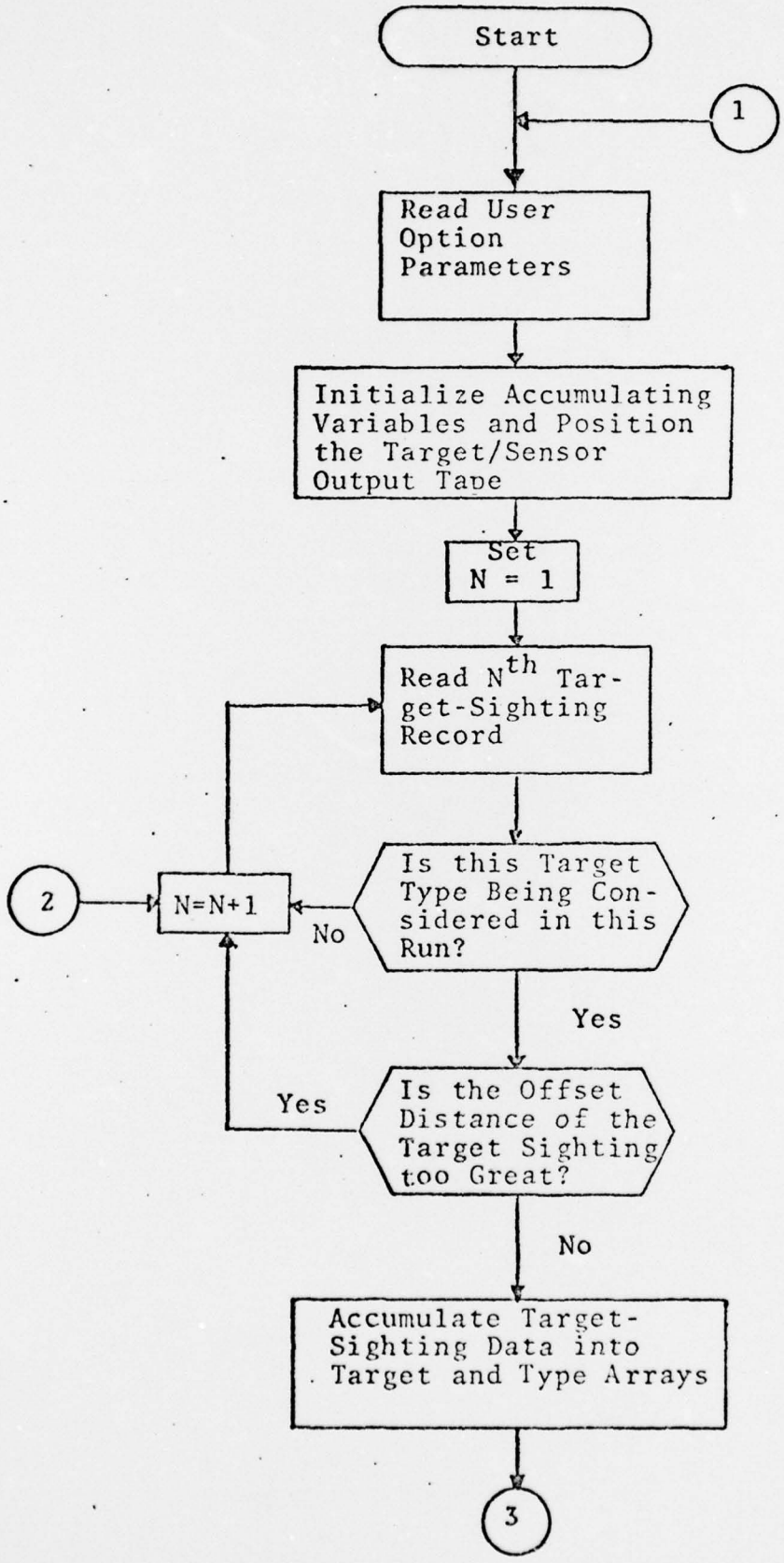

Figure 5-4. Flow Chart of EVAL

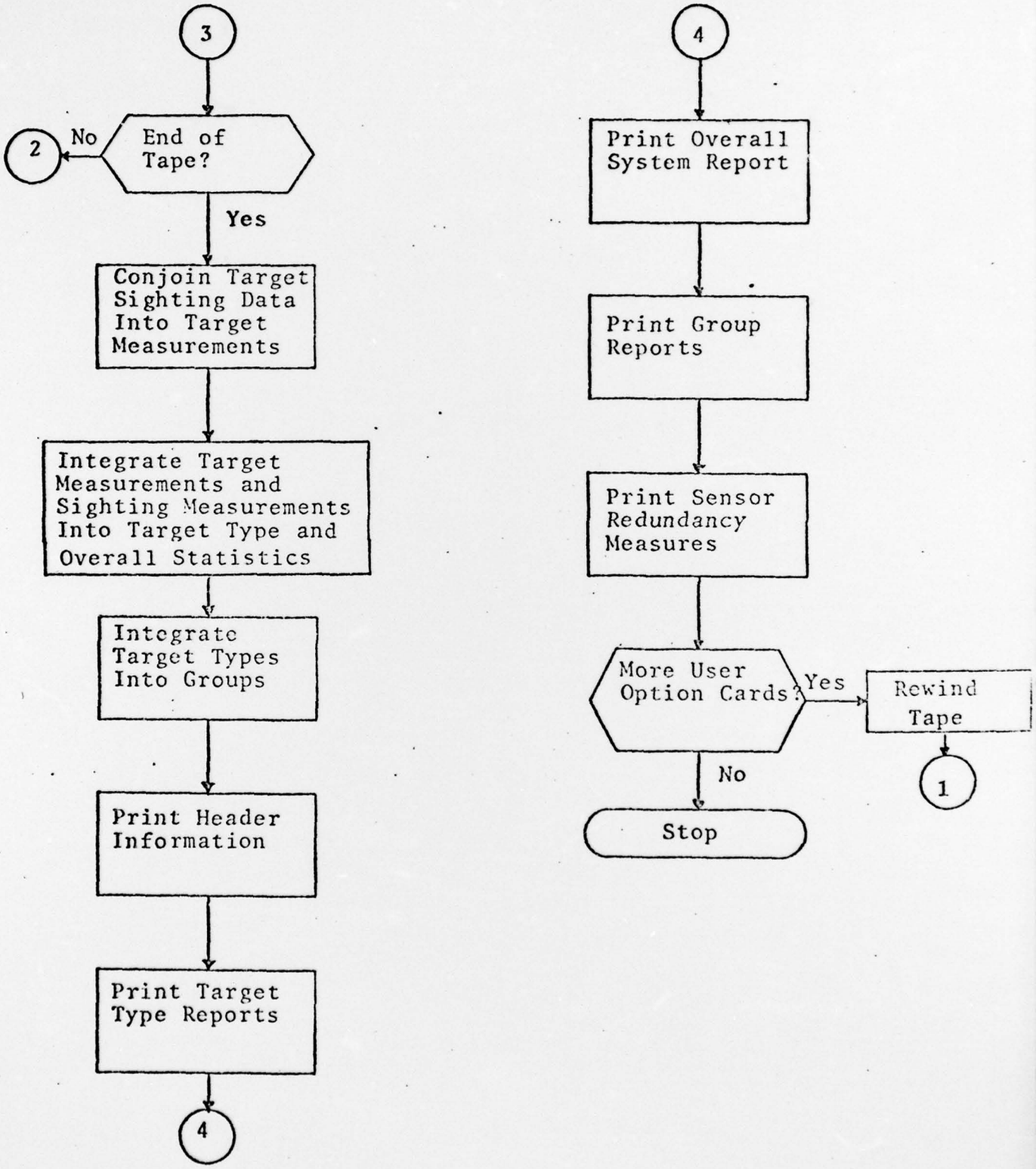

Figure 5-4. EVAL Routine (continued)

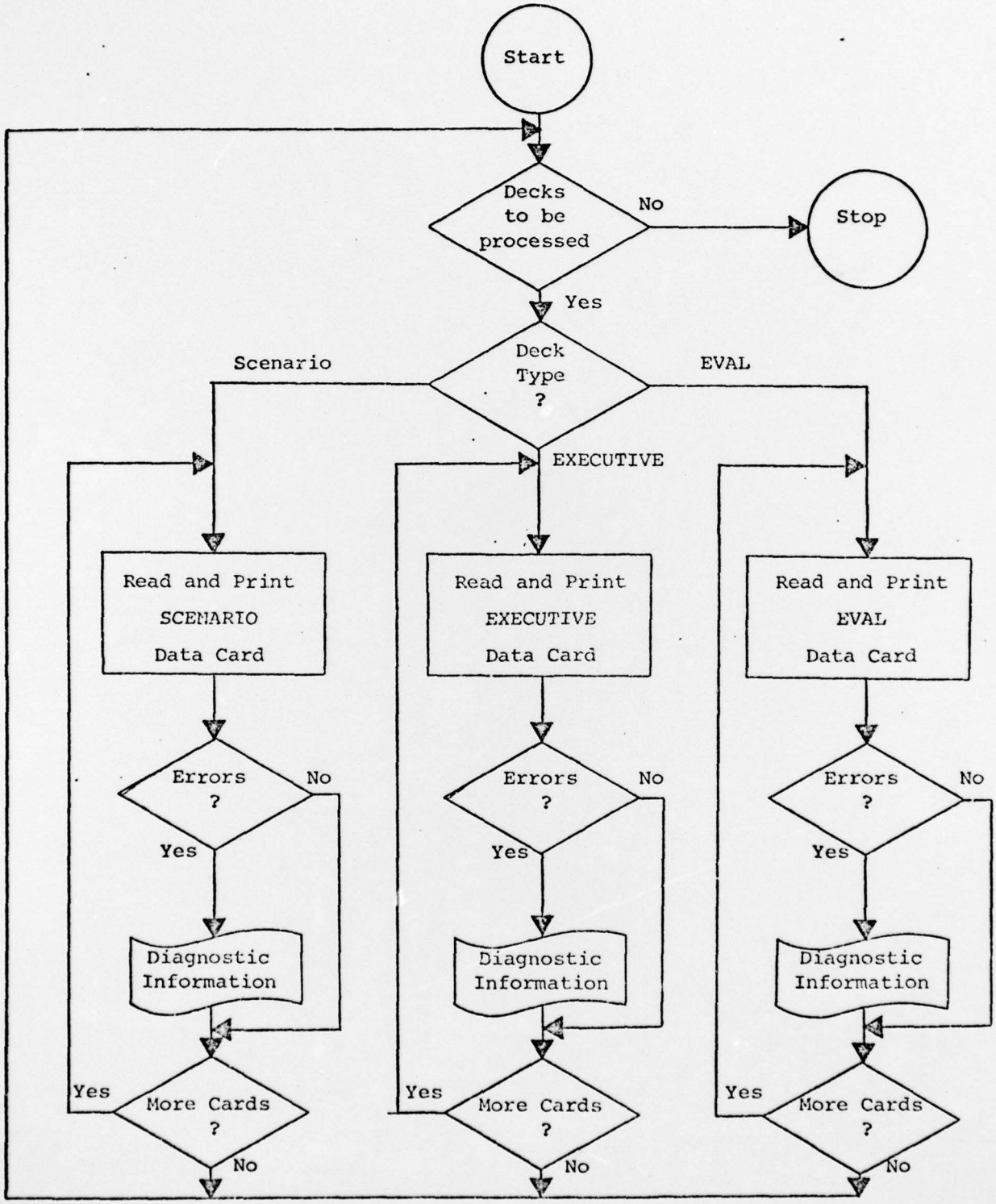

Figure 5-5. Flow Chart of PREPROC

VI. REFERENCES

1. Analytics, "Simulation of Advanced Integrated Reconnaissance Systems (AIRS)," Vol. I. Submitted to NADC under Contract No. N62269-68-C-0441 on 4 April 1969.

2. Analytics, "Improvements and Modification of the Airs Performance Model". Submitted to NADC under Contract No. N62269-69-C-0532 on 27 February 1970.

3. Analytics, "Programmer's Guide to AIRS EVAL". Technical Memorandum 1017-C.

APPENDIX A

MEMORANDA

ANALYTICS
INCORPORATED

179 WASHINGTON LANE, JENKINTOWN, PA. 19046 □ (215) 885-4242

MEMORANDUM

TO: File 1120

FROM: Paul Lewin

DATE: 28 March 1974

SUBJECT: AIRS PROGRAM MODIFICATION

In subroutine COMBINE of EXECUTIVE, the following change was made to avoid division by zero:

OLD

```
SUBROUTINE COMBINE
        :
DO 13 I1 = 1,I2
QZ = (expression)
FZ = (expression)/QZ
FZ = QZ
13 CONTINUE
```

NEW

```
SUBROUTINE COMBINE
        :
DO 13 I1 = 1,I2
QZ = (expression)
IF (QZ.EQ.0.) GO TO 100
101 FZ = (expression)/QZ
 13 CONTINUE
100 FZ = large number
GO TO 101
```

MEMORANDUM

TO: FILE 1120
FROM: Paul Lewin
DATE: 16 April 1974
SUBJECT: CONVERSION OF AIRS PROGRAMS

SCENARIO, EXECUTIVE, INTER, EVAL have been converted from CDC 3200/3300 FORTRAN to CDC 6600 FORTRAN. The following lists the types of changes that were required:

1. Variable and subroutine names consisting of 8 alphanumeric characters (acceptable to CDC 3200/3300 FORTRAN compiler) were shortened to 7 alphanumeric characters (required by CDC 6600).

2. Explicit references to FORTRAN II functions (SQRTF, LOGF, ATANF, etc.) were changed to the proper CDC 6600 function references (SQRT, ALOG, ATAN, etc.)

3. Both the CDC 3200/3300 and the CDC 6600 allow nested DO LOOPS to share a single CONTINUATION statement. The CDC 3200/3300 allows an outer DO-LOOP to skip the next innermost DO-LOOP by testing for the 'skip condition' and transferring to the shared CONTINUE statement. The CDC-6600 FORTRAN compiler requires separate CONTINUE statements to accomplish this. Changes were made where required.

4. EVAL made reference to a CDC 3200/3300 utility subroutine LOCATE. This disc random access mass storage I/O reference was replaced by the appropriate CDC 6600 mass storage I/O (OPENMS, READMS, WRITMS).

5. EXECUTIVE writes a short last record on file TAPE 2. Both INTER and EVAL attempt to read this last record with a longer I/O list. The attempt to look for data beyond the EOF/EOI is fatal to CDC 6600 execution. EXECUTIVE was changed to write a longer last record.

6. COMBINE OF EXECUTIVE was changed to prevent attempt to divide by zero.

7. In EXECUTIVE

   READ (1) ..... (MSEN(I2) = 1,14) ....

   changed to

   READ (1) ..... (MSEN(I2) = 1,15) ....

   for combatibility with SCENARIO WRITE list. This only affects the geodetic probability and geodetic CEP of different camera types and was discussed with Larry Rafsky.

8. Proper CDC 6600 PROGRAM cards were added.

9. Reference to CDC 3200/3300 SSWTCHF utility was converted for CDC 6600 operation.

MEMORANDUM

TO: File 1120

FROM: Paul Lewin

DATE: 21 June 1974

SUBJECT: AIRS PROGRAM MODIFICATION

In main program SCENARIO, a change was made to avoid division by zero. This could occur if the MTIFLR logic calculated GIMP with NLOOMS=1.

OLD

```
PROGRAM SCENARIO
      :
NLOOKS=G(10)+.5
DO 670 IKL=1,NLOOKS
GIMP=(FLOAT(NLOOKS-IKL)*G(8)
     +FLOAT (IKL-1)*G(9))/
     (FLOAT(NLOOKS-1))
CALL TERRAIN (etc.)
      :
```

NEW

```
PROGRAM SCENARI
      :
NLOOKS=G(10)+.5
DO 670 IML=1,NLOOKS
IF (NLOOKS NE 1) GO TO 8
   GIMP=(G(8)+G(9))/2.
   GO TO 10
8 GIMP = (FLOAT(NLOOKS-IKL)*G(8)
         + FLOAT(IKL-1)*G(9))/
         (FLOAT (NLOOKS-1))
10 CALL TERRAIN (etc.)
      :
```

ANALYTICS
2500 MARYLAND ROAD, WILLOW GROVE, PA. 19090 □ (215) 657-4100

TECHNICAL MEMORANDUM

TO: File 1120

FROM: Paul Lewin

DATE: 4 September 1974

SUBJECT: SIGHTINGS VS. TARGETS
OPPORTUNITIES VS. NUMBER

Item (4) describes four quantities. In order to understand these it is necessary to understand the following two dichotomies with respect to a given target type:

(1) Count of Sightings vs. Count of Targets. We can count sightings or we can count targets. In a multipass mission, the reconnaissance system may "see" a physical target more than once. If so, the count of sightings will exceed the count of targets for this target type. If the target type were trucks, then the count of sightings answers the question: "How many trucks were 'seen'?" If the same truck is seen twice, then it is counted twice. However, the count of targets answers the question "How many physically different trucks were there?" As such, two sightings of the same truck are not counted twice. The count of targets is used for target unit measures; the count of sightings for sighting unit measures.

When target unit measures are considered, the system performance is not adversely affected if a target is poorly detected (or identified, etc.) on one leg of the mission as long as it has been well detected on another. This is as it

should be, after all, the purpose of a reconnaissance flight is to detect targets, and less concern should be given to performance against individual sightings. On the other hand, when the performance of separate sensors is being examined, sensor's effectiveness measure is based on how well it does at every opportunity; this is affected if a sensor does poorly on one sighting of a target even if it does well on another.

(2) Number vs. Opportunities. There are really two modes of counting sightings and counting targets. The sensor suite has an "opportunity" to detect and possibly identify a target only if the target falls within the field of view of at least one of the sensors. This is counting by opportunities.

The user may also be interested in keeping track of counts of sightings and counts of targets subject only to the condition that the sightings/targets fall closer than some user specified maximum distance (AMAXOF). This is counting by number. Thus, the number of sightings/targets may exceed the count of "opportunities" for sighting/targets if AMAXOF is suitably large.